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ASBESTOS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

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ASBESTOS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

INTRODUCTION

This bibliography contains 160 abstracts of documents and articles on asbestos. These abstracts are numbered sequentially on their upper right corner. The number on the upper left corner is the APTIC accession number.

An author index, a title index, a subject index, and a geographical location index follow the abstracts. The author index lists all authors individually. The first author is indicated by an asterisk (*). The indexes refer to the abstracts by the number on their upper right corner.

All documents abstracted herein are currently on file at the Air Pollution Technical Information Center, Air Pollution Control Office, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27709. Readers outside the Air Pollution Control Office (APCO) may seek duplicates of documents directly from libraries, publishers, or authors.

GENERAL

12438 1

Bowles, Oliver

ASBESTOS - A MATERIALS SURVEY. Bureau of Mines Information Circ. 7880, 94p, 1959. 61 refs.
CFSTI, DDC: AD 680442

The present report on asbestos is a revision of a survey first published in 1952, the demand-supply position of asbestos in the United States. It includes information on production, imports, consumption, exports, capacity, interchangeability, substitutes, and possibilities for expansion. Price histories and trade figures are presented for the years 1935 or earlier to 1965. The properties of the commodity are described. Exploration, mining, milling, and processing methods are discussed. Included is an extended presentation of the structure of the industry covering major corporations, tranportation services, processing facilities, interrelationship to other industries, pertinent laws and taxation policies, tariffs, government controls, special labor problems, and the history of wartime controls. (Author forward modified)

20859 2

O'Sullivan, Dermot A.

AIR POLLUTION. Chem. Eng. News, 48(24):37-41, 45-46, 50, 54-55, 57-58, June 8, 1970.

Various aspects of air pollution from its sources to the costs of control are discussed. The pollutants originate from industrial processes, paper and pulp operations, petroleum refineries, and chemical plants; from garbage dumping, trash incineration, and agricultural burning; from power generation and space heating; and from automobiles, trucks, and aircraft. The chemical reactions that produce photochemical smog are reviewed. Weather conditions that prevail at any particular time and the topography of an area have a marked influence on the effects of pollution. A number of airborne pollutants, such as carbon monoxide, sulfur dioxide, nitrogen oxides, ozone, and polynuclear hydrocarbons, have been studied to determine their effects on health. Air pollution levels are linked to higher death rates from coronary heart disease and stroke; airborne asbestos particles may lead to lung cancer, mesothelioma, and cancer of the peritoneum or pleura. The effects of pollutants on crops and plant life are assessed. Accurate monitoring is needed to control pollutants and to set the standards to limit their concentrations in the air. Auto emission reduction methods are discussed, as well as the costs for pollution control.

EMISSION SOURCES

10667 3

Feldstein, M. L., B. Potter, A. E. Alcocer, and H. Moore

THE COLLECTION AND ANALYSIS OF INORGANIC DUST DOWNWIND OF SOURCE EFFLUENTS. Preprint, Bay Area Air Pollution Control District, San Francisco, Calif. and California Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab., 7p., 1968. 6 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-11.)

Dust collected downwind from two types of industrial operations is analyzed. One is concerned with the emission of cement dust from a materials handling operation within a cement manufacturing plant; and the other deals with the emission of mica dust in an asphalt saturating operation. The method of sampling used to collect dust was the same in both cases. The basic collecting apparatus consisted of high volume samplers, operated by directional control unit. Each directional control unit activated a sampler when the wind blew from a predetermined direction. One sampling set was placed downwind of the source and a second placed upwind. Both were oriented in the same direction, being activated by the same wind sweeping across the source. Comparative samples were thus provided for evaluation of the source as a cause for nuisance complaints. After the sampling period was completed the filters were removed and the collected materials were chemically processed and analyzed by X-ray spectrometry, and by microscopic examination. Authentic samples of cement dust and mica dust from the industrial sources were also obtained and submitted for comparison and analysis. Results of the analysis show that mica dust was present in the asphalt case to the extent of 15-20% of the total inorganic dust collected. Cement dust was present in the cement manufacturing case to the extent of 10-15% of the total inorganic dust collected. Upwind samples contained little or none of the respective minerals. It is reasonable to conclude that the collected mineral in each was contributed by the suspected source.##

03913 4

A. M. Kesting

DUST MEASUREMENT IN PLANTS WITH ASBESTOS PROCESSING MACHINERY. Staub (English Translation.) 26, (10) 14-6, Oct. 1966. Ger. (Tr.)
CFSTI, TT66-51159/10

An inventory of the concentration of dusts associated with the asbestos - processing branch of the textile industry is presented. Observations made over longtime periods have given basic data for dust concentrations occurring in the individual processing stages. Statistical evaluat9on of all results of dust measurements shows that there is a continuous decrease in dangerous dust concentration. The object of further investigations is to find out (by comparing cases of illness caused by asbestos with asbestos dust concentrations) at what concentration and exposure time the danger of illness caused by asbestos in negligible. (Author summary modified)##

01247 5

A. Laamanen, L. Noro, and V. Raunio

OBSERVATIONS ON ATMOSPHERIC AIR POLLUTION CAUSED BY ASBESTOS.
Ann N.Y. Acad. Sci. 132, 240-54, Dec. 31, 1965.
(Presented at the Biological Effects of Asbestos Conference,
New (york City, (oct. 19-21, 1964.)

The mining (quarrying) of asbestos in Finland has been carried out for approximately fifty years. Current production is about 15,000 tons of anthophyllite asbestos per year. Two preliminary air pollution surveys indicate that asbestos dust is disseminated from mining (quarrying) and milling areas rather extensively, while the degree of pollution varies with the distance from the source and the prevailing winds.##

09238 6

Mader, P. P., and E. S. Mills

CONTAMINANT CONTROL IN SPACE CABINS: APPROACH AND RESULTS.
Aerospace Med., 38(8):822-825, Aug. 1967, 4 refs.

The systematic screening of materials and supplies intended for use inside space cabins is described. Materials were screened on the basis of their outgassing properties at 120 deg F. for 72 hrs. in an apparatus consisting of a closed 72-1. Pyrex flask containing 50 percent O2 and 50 percent nitrogen and equipped with several inlet tubes through which gas samples were withdrawn for gas chromatographic and infrared analysis. Pressure within the flasks was adjusted to 0.5 atm. The test temperature of 120 deg F. was selected as the highest level at which the chromatograms and infrared spectra were still representative of the actual components in the gaseous system. When paints and finishes were tested, a water-based methacrylate paint was found to release the smallest amounts of outgassing products, while epoxy paint and polyvinyl acetate released considerably larger volumes of outgassing products. A sound dampener was discarded when tests indicated the release of substantial amounts of formaldehyde. Glasswool and asbestos ribbons released large amounts of organic compounds, although they had been previously flashfired at 700 deg F. One insulating material was selected after 6 were screened. Trichlorethylene, used as a space cabin cleaner, should not be used for a final cleaning of a space cabin simulator because it forms toxicchlorinated acetylenes. Atmospheric contaminants were also measured during a 30-day test of the space cabin simulator by 4 men.##

03914 7

F. Walter

EVALUATION AND ASSESSMENT OF DUST MEASUREMENTS IN ASBESTOS PLANTS OF THE TEXTILE INDUSTRY. Staub (English Translation)
26, (10) 16-9, Oct. 1966. Ger. (Tr.)
CFSTI, TT 66-51159/10

The konimeter measurements carried out over 15 years in asbestos plants of the textile industry, and their classification according to the microphotographic tests are presented. An accurate picture of the situation as regards dust concentration is given. Gravimetric measurements give an average value; they can also be used for an assessment by coefficients. There is a limited relationship between the values measured by filtering instruments and those obtained by konimeter. This is particularly valid when the dust concentration lies below the danger limit. (Author summary modified)##

MEASUREMENT METHODS

00907 8

C. G. Addingley

ASBESTOS DUST AND ITS MEASUREMENT. Ann. Occupational Hyg. (London), Vol. 9:73-82, April 1966. (Presented at the Scientific Meeting of the Society at the London School of Hygiene and Tropical Medicine, Nov. 11, 1965.)

The nature of asbestos dust and the testing requirements are discussed. Existing standard methods are briefly reviewed. The development of a membrane filter method of dust counting for asbestos is described in detail. It is thought to be an improvement on existing methods. Tyndallometric methods are considered, and a description of the application of the "Royco" Particle Counter, an instrument based on this principle, to factory testing is described. It is believed that this instrument represents a big advance in routine test methods. (Author summary)##

03309 9

C. G. Addingley

DUST MEASUREMENT AND MONITORING IN THE ASBESTOS INDUSTRY. Ann. N.Y. Acad. Sci. 132, 298-305, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Author concludes that after nine months experience it was found that the Royco Particle counter represents the best available method for dust testing in asbestos factories. Probably for the first time a method is available to enable, without inordinate labor, enough tests to be made of atmospheric dust concentrations to give results which are reliable from the statistical point of view.##

01464 10

H. E. Ayer, J. R. Lynch, and J. H. Fanney

A COMPARISON OF IMPINGER AND MEMBRANE FILTER TECHNIQUES FOR EVALUATING AIR SAMPLES IN ASBESTOS PLANTS. Ann. N.Y. Acad. Sci., Vol. 132:274-287, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The relationship of dust counts by impinger sampling to fiber counts from membrane filters, using a higher resolution microscope objective for the latter, is considered. Based on 230 pairs of samples collected in four asbestos textile plants, the over-all ratio appears to be one mppcf by impinger (10x objective) to 10 fibers per ml. longer than 5 microns, or 3 fibers per ml. longer than 10 microns when the membrane filter samples are counted with phase contrast illumination on the transparentized filter using a 4 mm. (43x) objective. Individual operations may have ratios differing from these values by a factor of two. Size selective sampling using horizontal elutriators ahead of the sampling device indicated that the major portion of the fibers counted would reach the lung if inspired. The ratios are presented (1) as a rough indication of the relationship of impinger counts to fiber counts reported from abroad, (2) to give some indication of the relationship for fiber counts from personal samplers using membrane filters, and (3) as an index which may be used, in the absence of better information, to estimate the proportion of asbestos ina mixed dust exposure.##

01417 11

J. V. Crable

QUANTITATIVE DETERMINATION OF CHRYSOTILE, AMOSITE AND CROCIDOLITE BY X-RAY DIFFRACTION . Am. Ind. Hyg. Assoc. J., Vol. 27: 293-298, June 1966.

The determination of asbestos by x-ray diffraction in environmental samples is described. Evenly distributed mats of asbestos samples on molecular membrane filters are prepared for x-ray diffraction examination. Each asbestos mineral has its characteristic x-ray diffraction pattern. A qualitative scan of a mounted filtered sample identifies the crystalline substance present including the asbestos minerals. A quantitative determination of a given type of asbestos is made by measuring the area under its major diffraction peak and comparing this area with that of a known quantity of an external standard. (Author abstract)##

02479 12

J. V. Crable and M. J. Knott.

QUANTITATIVE X-RAY DIFFRACTION ANALYSIS OF CROCIDOLITE AND AMOSITE IN BULK OR SETTLED DUST SAMPLES. Am. Ind. Hyg. Assoc. J., 27(5):449-453, Oct. 1966.

A quantitative procedure for determining crocidolite and amosite in bulk or settled dust samples is described. Crocidolite and amosite are two of the three major types of asbestos fibers used in the United states asbestos industry. Each has a crystalline structure which provides a distinct x-ray diffraction pattern of sufficient intensity to be used in quantitative analysis. Quartz is used as the internal standard. A qualitative examination with the diffractometer establishes the presence of crocidolite or amosite in the samples and indicates possible interferences whose effects are minimized by using appropriate modifications of the quantitative procedure. Analysis of a series of known samples containing varied amounts of ground crocidolite provided a mean recovery of 99.6%. The lower end of the working range of the method is approximately 5% crocidolite. A separate series of known samples containing varied amounts of ground amosite provided a mean recovery of 96.88%. (Author abstract)##

09402 13

Edwards, G. H. and J. R. Lynch

THE METHOD USED BY THE U.S. PUBLIC HEALTH SERVICE FOR ENUMERATION OF ASBESTOS DUST ON MEMBRANE FILTERS. Ann. Occupational Hyg. (Oxford), 11(1):1-6, Jan. 1968. 5 refs.

es of air-borne mineral dusts are collected by drawing air gh cellulose ester membrane filters. Particles smaller than inal pore size are retained. Varying sampling rate and filter holder controls the distribution of dust across the filter face. Samples are mounted on standard microscope slides using a high viscosity solution of membrane filter material in a mixture of diethyl oxalate and dimethyl phthalate to render the filter transparent. The mount is stable for 28-30 days, but after this period, migration of the dust particles causes a loss of areal concentration. The grain and fiber dust particles, which lie on the surface of the filter, are counted with a phase contrast microscope, using 10X eye-pieces and a 4 mm. "high-dry" objective. The field area is delineated with a Porton graticule. Count data are recorded in a form allowing data reduction and statistical analysis by electronic computer. The method, although not suitable to determine compliance with the threshold limit value for asbestos that was developed from a different enumeration method, is highly suited for developing basic data for a more precise recommendation of the limit for asbestos.##

01435 14

S. Holmes

DEVELOPMENTS IN DUST SAMPLING AND COUNTING TECHNIQUES IN THE ASBESTOS INDUSTRY . Ann. N.Y. Acad. Sci., Vol. 132:288-297, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Author describes instrumentation that has been developed for dust sampling and counting and briefly reviews the current status of instruments under development for the dusts created in the asbestos industry. The Long Running Thermal Precipitator (Ottway Instrument), the membrane filter technique, and the "Royco" dust monitoring system are discussed. The need for sampling devices is urged by the Asbestosis Research Council (England).##

03913 15

A. M. Kesting

DUST MEASUREMENT IN PLANTS WITH ASBESTOS PROCESSING MACHINERY. Staub (English Translation.) 26, (10) 14-6, Oct. 1966. Ger. (Tr.)
CFSTI, TT66-51159/10

An inventory of the concentration of dusts associated with the asbestos - processing branch of the textile industry is presented. Observations made over longtime periods have given basic data for dust concentrations occurring in the individual processing stages. Statistical evaluat9on of all results of dust measurements shows that there is a continuous decrease in dangerous dust concentration. The object of further investigations is to find out (by comparing cases of illness caused by asbestos with asbestos dust concentrations) at what concentration and exposure time the danger of illness caused by asbestos in negligible. (Author summary modified)##

06677 16

F. V. Khukrin

MODERN APPROACH TO AIR DUSTINESS IN WORKSHOPS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 301-8, 1962. (Gigiena i Sanit.,) 24 (7) 50-5, 1959. Translated from Russian.
CFSTI: 62-11103

Extensive data were accumulated during recent years on the study of the effect of different types of industrial aerosols. Based on the summary and evaluation of new data obtained from work institutes, university apartments and practicing physicians a list was prepared of the maximum permissible concentration of 55 dusts and aerosols. This list is presented and improvements in those standards are recommended.##

08125 17

T. T. Lobova

STUDY OF THE PARTICLE SIZE DISTRIBUTION OF DUST BY THE MICROSCOPY METHOD. In: A. A. Letavet and Ye. V. Khukhrina (eds.), Methods of Studying Industrial Dust and the Incidence of Pneumoconioses. (Metody izucheniya proizvodstvennoy pyli i zabolevayemosti pnevmokoniozami.) Leningrad, Meditsina Publishing House, 1965, 123p. Translated from Russian. Clearinghouse for Federal Scientific and Technical Information, Washington, D. C., Joint Publications Research Service, TT 66-30952, p. 39-43, March 11, 1966.

The degree of dispersion of dust, determined by the microscopic observation of dust particles, is expressed in per cent of the number of dust particles of various sizes with respect to the total number of the particles measured. The study of the particle size distribution of dust is composed of the following operations: preparing the mount, calibrating the micrometer, measuring and counting the dust particles of specific fractions, and calculation of the particle size distribution. The dust specimen mounts are usually prepared directly at the production site, at the sample-taking location, i. e. in the breathing zone of the workers, as well as next to the dust producing spot, near the ventilation devices, in the air ducts, at the ventilation air exhausts, depending on the aims and tasks of the investigation. The basic disadvantages of the method of studying the particle size distribution by means of a micrsocope are connected primarily with the possibility of not obtaining satisfactory dust mounts, with not accurate calibration of the sizes of eye-piece micrometers, and finally, with the sensitivity and the susceptibility to fatigue of the eye in microscopic work, along with the exceptionally large amount of work involved. The main, most important disadvantage of the method in principle, is the feasibility to determine with its aid of the particle size distribution only according to the number of particles, whereas for the hygienic estimate it is important to know the mass of the dust of various particle size.##

02478 18

J. R. Lynch and H. E. Ayer.

MEASUREMENT OF DUST EXPOSURES IN THE ASBESTOS TEXTILE INDUSTRY. Am. Ind. Hyg. Assoc. J. 27(5):431-437 7, Oct. 1966.

Data obtained from environmental surveys of 9 asbestos textile mills, which represent the baseline for the textile segment of the PHS epidemiological study of asbestos processing industries are presented. From these data concentration ranges are derived which yield significant differences between typical sample groups. Various ratio tests of different methods of counting and analysis were made and count weight ratios based on magnesium analyses for asbestos were calculated. (Author abstract)##

03491 19

W. C. McCrone and R. Draftz

THE IMPORTANCE OF THINKING SMALL. Heating, Piping, Air Conditioning 38, (1) 126-33, 1966

Identification of micron-size particulates with the microscope is reviewed. Analytical steps of making a low power exam, using a first order red filter, and trying dispersion staining are discussed. Thirty-two full color photo-micrographs of typical contaminants are presented.##

01448 20

S. A. Roach

MEASUREMENT OF AIRBORNE ASBESTOS DUST BY INSTRUMENTS MEASURING DIFFERENT PARAMETERS . Ann. N. Y. Acad. Sci., Vol. 132:306-15, Dec. 31, 1965. (Presented at the Biological

Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

This paper records an investigation of 8 different methods for measuring airborne dust exposure. Four instruments used were for determining the number of particles in unit volume of air. These were: Mine Safety Appliances Midget Impinger; a (Membrane Filter;" Casella Thermal Precipitator; and a Royco automatic particle counter. In addition to four instruments designed for measuring the number of concentration of dust in air, there were four samplers which were designed to measure the mass concentration of dust in air. These were: Electrostatic Precipitator; Casella Soxhlet; UNICO respirable dust sampler; and a Casella Hexhlet. The general conclusion from this work was that the measurement of mass concentration was far simpler than the measurement of number concentration.##

09533 21

Szymczyhiewicz, Konrad, and Edward Wiecek

EVALUATION OF THE USEFULNESS OF MEMBRANE AND FIBER FILTERS FOR DETERMINING THE CONCENTRATION OF INDUSTRIAL DUST WITH DIFFERENT PARTICLE SHAPE. ((Ocena przdatnosci filtrow membranowych i filtrow wlokninowych do pomiarow stezen pylow przemyslowych o roznym ksztalcie ziarn.)) Text in Polish. Med. Pracy (Warsaw), 18(5):489-495, 1967. 4 refs.

Dust concentration measurements using MSA electrostatic sampler (USA), membrane filters AUFS (Czech) and AF-400 (West German), and synthetic microfiber filters PC-8 (Czech) were made by different methods to determine the reliability of individual methods and filters. When the electrostatic filter and the described filtration methods were used, results agreed closely for mineral dust with polygonal or spheriodal particles and for fibrous dust such as asbestos, flax, and synthetic fiber "Anilana" Agreement was not good for cotton dust or a mixture of cotton with asbestos dust. Flat membrane filters and fibrous filters are not considered adequate for the measurement of cotton dust and conically or cylindrically shaped membrane filters should be used.

(USA), membrane filters AUGS (Czech) and AF-400 (West German), and synthetic microfiber filters PC-8 (Czech) were made by different methods to determine the reliability of individual methods and filters. When the electrostatic filter and the described filtration methods were used, results agreed closely for mineral dust with polygonal or spheroidal particles and for fibrous dust such as asbestos, flax, and synthetic fiber "Anilana". Agreement was not good for cotton dust or a mixture of cotton with asbestos dust. Flat membrane filters and fibrous filters are not considered adequate for the measurement of cotton dust and conically or cylindrically shaped membrane filters should be used.##

08468 22

Wickert, Kurt

SO3 DETERMINATION IN DUST-LADEN AND DUST-FREE COMBUSTION GASES. ((SO3-Bestimmung in staubhaltigen und staubfreien Verbrennungsgasen.)) Text in German. Erdoel Kohle (Hamburg), 20(8):568-572, Aug. 1967.

An analytical method is described which allows an exact determination of the SO3 content of dust-free as well as of dust-laden combustion gases. The apparatus for dust-free analysis is illustrated and two tables are given showing the analytical data obtained with the catalytic temperature at 450 deg C and 550 deg C respectively and an asbestos layer at 75 deg C. A third table shows the gas temperatures at different catalytic temperatures and gas flow velocities. The condensation tube of the apparatus should contain at least 4 to 5 gms of asbestos in a 4 cm long layer and the catalytic temperature should be high if correct SO3 values are to be obtained. For SO3 determination in dust-laden combustion gases a modified apparatus is illustrated. The dust in the gas reacts with the SO3 (or the sulfuric acid) and if this dust reaction is disregarded the result of the analysis becomes incorrect, the error increasing with increasing amounts of reactivity of dust. In the analytical method described, this dust reaction is taken into account and the SO3 (vol. %) in dust-free gas, dust-laden gas, and fuel gas is tabulated. It is further shown that analytical difficulties result if calcium oxide is present in the dust. The conditions under which SO2 reacts with dust to produce sulphate are indicated.##

CONTROL METHODS

03311 23

D. W. Hills

ECONOMICS OF DUST CONTROL. Ann. N.Y. Acad. Sci. 132, 322-34, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

A brief historical introduction is given about conditions in the U.K. asbestos textile industry in the late 1920's and early 1930's; reference is made to the 1931 conference between employers and the Home Office that resulted in a code of practice being established for dust suppression in asbestos textile factories. Details are given of the various methods used for dust control in the Company's factories together with the cost of these measures. Some figures are also given for the cost of dust control of dust control at the Cape Asbestos Co. Ltd.'s new amosite mill at Penge. Current work on improving dust control is discussed together with the part now played in this by the asbestosis Research Council. Although asbestos textiles form only a part of the asbestos industry their particular significance for this monograph is that, at least in the United Kingdom, the hazards associated with the processing of asbestos were recognized soooner on the textile side than almost anywere else. This was because most of the processes were dry, and hence dust was readily formed, and also because most of the processes were dry, and hence dust was readily formed, and also because the workers in some of the largest factories formed a close-knit population whose employment records went back for many years. Thus, when the hazard was first investigated an excellent sample of people with varying periods of exposure to dust was available.##

14280 24

Khan, A. A., R. V. Amalraj, and S. Ramachandran

APPLICATION OF THEORY OF FILTRATION ON A SPECIFIC QUALITY OF ASBESTOS. Bhabha Atomic Research Centre, Bombay, India, Waste Treatment Div., B.A.R.C.-351, 30p., 1968. 2 refs.
CFSTI: N69-28114

The resistance characteristics of a typical indigenous Indian asbestos fiber were investigated as part of a study to determine the suitability of these fibers for the production of high-efficiency air filters for industrial use in particulate removal. An attempt was made to calculate the mean fiber radius within a filter, to which single-fiber mathematics could then be applied for greater ease in predicting fiber performance in a filter system. Certain characteristics of the fiber were determined experimentally on the basis of Darcy's Constant, including volume flow rate, depth of the bed, viscosity of air, cross sectional area of the fibrous bed, and specific gravity. The method consisted of dispersing asbestos fiber in a mixer to form a bed of known basic weight. Water in the bed was removed by suction; the bed was then dried and a known amount of air forced through at a constant pressure difference, by means of a densometer. Thickness of the bed was measured by a travelling microscope; its thickness, size, weight, and density were used to estimate its porosity. These characteristics were then applied to various equations which use measurement of pressure drop across a filter in order to determine mean fiber radius; the equations of Sullivan and Hertel, Davies, Langmuir, and Iberall were included. It was found that Langmuir's equation gave results which agreed most closely with estimates made from microscopic observation. Tabular data presenting the results of all experimental procedures and calculations are included.

03942 25

F. M. Kogan S. Y. Troitskii

HYGIENIC ASSESSMENT OF MEASURES FOR DUST CONTROL AT ASBESTOS-DRESSING FACTORIES. Hyg. Sanit. 31, (4-6) 453-6, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

Improvement in the sanitary working conditions has had a distinctly favorable effect on the incidence of asbestosis in Russia. The incidence of asbestosis was reduced by a factor of 11.6 in a group of workers with a duration of service ranging from 11 to 15 years, and by a factor of 3.2 in a group of workers with a service duration of 16 years and more. The favorable effect of reduced dust contents in the air on the health of workers was demonstrated by the fact that in newly built factories workers who had not previously worked at other asbestos-dressing factories did not include even a single case of asbestosis, although many fo them had been working for a period of ten years in air containing quantities of dust. In spite of the recent considerable improvement in working conditions, these still do not protect against an incidence of asbestosis, and there is a necessity for the implementation of several preventive measures. A certain amount of dust is discharged with flue gases from drying ovens, and therefore the installation of electrostatic precipitators is recommended for the trapping of such discharges. All operations of mixing and packing of the fiber should be improved. Among other measures, favorable hygienic assessment is merited by the Canadian method of packing asbestosis fiber in the form of briquets. No less promising is the packing of fiber in the form of briquets molded under high pressure. The initial experiment performed at the scientific research institute of the asbestos industry gave encouraging results. At the same time, it is useful to moisten the asbestos fiber before briquetting.**

13986 26

American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, Committee on Air Pollution

PROCESS FLOW SHEETS AND AIR POLLUTION CONTROLS. Cincinnati, American Conference of Governmental Industrial Hygienists, 1961, 40p. 33 refs.

A variety of industrial processes, described in the text and illustrated by flow charts, are categorized according to the odors or pollutants produced by each stage of plant operations. Appropriate primary and secondary air cleaning equipment, including dry centrifuges, wet scrubbers, and fabric and electrostatic filters, are matched to each operation and evaluated as satisfactory or not satisfactory. The suggested controls have applications for asphalt and cement plants, gray iron or malleable foundry operations, the milling of asbestos ores, alfalfa dehydrating plant operations, coffee processing, iron and steel making, and scavenger-type rendering processes. Suggested reference sources are included for each process.

13517 27

Shiels, D. O.

THE ADSORPTION OF SULPHUR DIOXIDE BY PLATINISED ASBESTOS. J. Phys. Chem., 33:1167-1174, 1929. 4 refs.

Studies were performed on the sulfur dioxide adsorbing capacity of platinized asbestos in the absence of air at 25 C and up to 40 mm pressure. Platinized asbestos had a greater adsorption rate than either platinum or asbestos alone. The adsorption was reversible, and there was a complete absence of hysteresis. At 20 mm, 11.6 vols SO2/vol platinum were adsorbed. The isotherm is represented accurately by Langmuir's equation.

09788 28

Simon, Herbert

BAGHOUSES. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 106-135, 1967.
GPO: 806-614-30

When high collection efficiency on small particle size is required, the most widely used method consists of separating the dust from the air by means of a fabric filter. The fabric is usually made into bags of tubular or envelope shape. Filter fabrics normally used to remove dust and fumes from airstreams are usually woven with relatively large open spaces, sometimes 100 microns or larger in size. Small particles are initially captured and retained on the fibers of the cloth by means of interception, impingement, diffusion, gravitational settling, and electrostatic attraction. Once a mat or cake of dust is accumulated, further collection is accomplished by sieving as well as by the previously mentioned mechanisms. The cloth then serves mainly as a supporting structure for the dust mat responsible for the high collection efficiency. Selecting or designing a baghouse requires the following initial steps: The minimum volume to be vented from the basic equipment must be determined according to the principles set forth elsewhere in this manual; A maximum desirable baghouse resistance must be estimated; The blower operating point is selected to provide the minimum required volume at the maximum baghouse resistance; A minimum baghouse resistance is estimated for the condition immediatly after the filter bags are thoroughly cleaned; A second operating point on the blower characteristic curve is determined for the clean bag condition; The minimum filtering area required Ohio, National Center for Air Pollution Control, PHS-Pub-particular dust or fume being collected; The calculations are rechecked, with the filtering area thus determined to ensure compatability; Recommended maximum filtering velocities and minimum dust-conveying velocities for various dusts and fumes are listed. The filtering media selected for use in a baghouse must be compatible with the temperature and pH of the effluent. Maximum permissible temperatures and chemical resistance are listed for the various filters normally used for filter media in dust collectors. Typical specifications for a few glass filters are also listed. The installation and cleaning of filters; disposal of collected dust; and baghouse construction and maintenance are discussed in detail.

05049 29

A. L. Pitman and S. T. Gadomski

THE SULFATE CYCLE FOR CARBON DIOXIDE REMOVAL AND OXYGEN GENERATION. Naval Research Lab., Washington, D.C., (NRL Rept. No. 6033.) Feb. 18, 1964. 18 pp.

A laboratory-scale plant of the Na_2SO_4 cycle system for oxygen generation and CO_2 removal aboard nuclear-powered submarines was constructed and operated. Joint operation of the major components was considered successful. The diaphragms used in the electrolytic cell were expected to provide difficult problems, and although asbestos diaphragms were known from the start to have a limited usefulness under anodic conditions, they proved to be more troublesome than anticipated. A replacement, microporous rubber diaphragms in miniature electrolytic cells, achieved several continuous runs of 125 days. Diaphragm problems in the laboratory -scale plant, however, continued as attempts were made to generate higher concentrations of alkali than had been made in the miniature cells. New difficulties appeared with an increase in porosity of the cathode diaphragms caused by the leaching action of sodium hydroxide on a residue of silica-gel which had been used as a pore forming material in manufacturing microporous rubber. Attempts to solve this problem were only partially successful, and it became evident that single sheets of microporous rubber which were free of leachable silica but had the specified porosity were required as anodic and cathodic diaphragms. While such diaphragms are not on hand, they could be made available commercially as soon as a demand should develop. With the diaphragm problem considered solved if the designated microporous rubber were used, results obtained on the laboratory-size sulfate cycle system establish the feasibility of this system for nuclear-submarine service. (Author abstract)##

EFFECTS – HUMAN HEALTH

07924 30

Anjilvel, L., and W. M. Thurlbeck

THE INCIDENCE OF ASBESTOS BODIES IN THE LUNGS AT RANDOM NECROPSIES IN MONTREAL. Can. Med. Assoc. J. (Toronto), Vol. 95, p. 1179-1182, Dec. 3, 1966. 11 refs.

Random necropsies of adult patients who died in four Montreal hospitals were made to determine the incidence of asbestos bodies in the lungs. Fresh unstained smears from the lungs were obtained by either a scraping or a squeezing method to estimate the degree of contamination. The asbestos bodies, which were identified morphologically, were the same as those encountered in asbestosis. All "pseudoasbestos bodies" were excluded. Asbestos bodies were generally scanty, but were found in 48 of the 100 necropsies. Men were more heavily contaminated than women. In the series as a whole, age did not appear to affect the incidence of asbestos bodies. There was no assessment of occupational exposure. The prevalence in Montreal of a high incidence of asbestos bodies in the lungs is compared with other cities. The difference in results obtained by using the two techniques is noted. No association was noted between the presence of asbestos bodies and death from malignant disease.##

09718 31

Ashcroft, Thomas

ASBESTOS BODIES IN ROUTINE NECROPSIES ON TYNESIDE: A PATHOLOGICAL AND SOCIAL STUDY. Brit. Med. J. (London, 1(5592):614-618, March 9, 1968. 19 refs.

Smears were prepared from the base of the right lung in 311 routine necropsies of patients over 15 years of age. Asbestos bodies were found in 20.3 percent of cases (25.5 percent of 196 males and 11.3 percent of 115 females). The majority of smears contained scanty bodies, but in 17 cases they were numerous. In cases with positive smears, histological sections failed to reveal asbestos bodies in over 50 percent. Histological evidence of minimal asbestosis was found in 10 cases. There were no cases of classical asbestosis. The series includes one case of mesothelioma of pleura. There was no significant excess of positive smears in patients dying from gastrointestinal or lung carcinoma. The incidence was higher in patients living in urban areas (25.6 percent) than in those from rural areas (3.5 percent). Twenty-nine patients definitely or probably were exposed to asbestos dust at work and 2 further patients had non-occupational exposure. Neighborhood contamination with asbestos dust is probably not important in this series. When compared with a series of 23 cases of mesothelioma of pleura or peritoneum, 21 (91 percent) of which showed asbestos bodies in histological sections of lung, the greater incidence of asbestos bodies in the cases of mesothelioma is statistically highly significant. (Author's summary)

07040 32

H. E. Ayer, J. R. Lynch

MOTES AND FIBERS IN THE AIR OF ASBESTOS PROCESSING PLANTS AND HYGIENIC CRITERIA FOR AIRBORNE ASBESTOS. Proc. Intern. Symp. Inhaled Particles Vapours, II, Cambridge, England, 1965. p. 511-521, 1967.

The Division of Occupational Health of the U.S. Public Health Service is presently conducting a study of health hazards in the asbestos processing industry. The study objectives are: To determine the health status of the asbestos workers in this industry with special attention to diseases of the respiratory tract. To determine which environmental factors have an adverse effect upon the health of asbestos workers in the asbestos products industry. To determine the relationship between occupational exposure and cause of death of asbestos workers and to develop medical and environmental criteria and procedures for the control of health risks identified by the studies. In operations where asbestos is handled (even if it is not mixed with other minerals), both motes and fibers are generated. By either count or respirable mass, the motes account for a major portion of the particulate exposure. Mote count, fiber count, measurement of gross respirable mass concentration, and chemical or physical analysis of the respirable particulate are all methods with certain advantages. For day-to-day controls, a rapid moderately accurate method is necessary. For enforcement of standards, a method with maximum reproducibility which is also a good index of hazard is required. For research studies to relate health effects to environmental exposures, a battery of methods must be used to characterize the particulate completely.##

03316 33

M. E. Bader, R. A. Bader, A. S. Tierstein, I.J. Selikoff

PULMONARY FUNCTION IN ASBESTOSIS: SERIAL TESTS IN A LONG-TERM PROSPECTIVE STUDY. Ann. N.Y. Acad. Sci. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19, 1964.) 132, 391-405, Dec. 31, 1965

Studies of pulmonary function in asbestosis of the lung have been previously reported. There is good agreement that the principal findings include reduced vital capacity, fairly well preserved maximum breathing capacity, hyperventilation at rest and particularly on exercise, decreased diffusing capacity of the lung, impaired oxygenation of the arterial blood, and reduced pulmonary compliance. No significant incidence of pulmonary emphysema has been reported. Previous studies have had the same diffuculty assessing the degree of exposure to asbestos dust, and both clinical and physiological data have varied with respect to duration of exposure. There is a lack of serial observations in asbestos workers. The present study was undertaken to follow several parameters of pulmonary function in a group of workers who had been exposed to asbestos dust and then had been withdrawn from further industrial exposure. Data were collected over a ten year period, during which time clinical and radiological features were also followed. In 1954-1955 17 workers were made the subject of careful pulmonary function studies, and follow-up studies, varying from 1 to 3 subsequent studies, were made in 13. Additional observations on 21 asbestos workers were made with reference to pulmonary compliance to obtain information relative to vital capacity independent of patient performance. These data will be presented also. (Author introduction)##

08904 34

Battigelli, Mario C.

FUNCTIONAL LESIONS IN PNEUMOCONIOSIS. Arch. Environ. Health, 15(5):629-637, Nov. 1967. 56 refs. (Presented at the Hatch Symposium, Graduate School of Public Health, Pittsburgh Univ., Pa., July 18-19, 1966.)

A review of the literature on the main points of abnormal functions associated with specific dust conditions is presented. The function of the lungs in terms of size, ventilatory power and efficiency of gas transfer in pneumoconiosis is discussed. Studies relating to chronic bronchitis and emphysema in pneumoconiosis are reviewed. Other topics include: pulmonary mechanics; mortality; and pulmonary infection.##

03301 35

C. Berkley J. Churg, I.J. Selikoff, W.E. Smith

THE DETECTION AND LOCALIZATION OF MINERAL FIBERS IN TISSUE. Ann. N.Y. Acad. Sci. 132, 48-63, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

A number of new techniques are described in this paper that make possible (1) the tagging of individual fibers with fluorochromes in vivo for a period of at least one month and (2) facilitate the detection of otherwise "invisible" individual asbestos fibers and mineral particulates by electronic ashing of sections. These techniques were designed for use (a) in experimental studies in animals to locate individual fiber in situ shortly after respiratory exposure and (b) in the study of human biopsy or autopsy specimens, especially in the absence of asbestos bodies. Localization by electronic ashing has proven highly satisfactory. Variations in procedure permit correlation of fiber location with histological structures. Studies of the effect of ashing on asbestos bodies are also described. The advantages of the concomitant use of phase microscopy were demonstrated. The results of the fluorochrome experiments raise the question of mechanical fixation of particulate carcinogens in tissue, as well as the adsorption and concentration of dilute carcinogenic agents. (Author Introduction)##

00830 36

A. Blesovsky

THE FOLDED LUNG AFTER ASBESTOS EXPOSURE. Brit. J. Diseases Chest (London) 60, (1) 19-22, Jan. 1966

Minor degrees of folding of the lung are commonly found during decortication of the lung for emphysema. Three case histories illustrate unusual extensive lung folding due to a fibrous membrane on the costal surface of the visceral pleura of the lower lobe; this fibrous reaction was not associated with adhesions between the parietal and visceral layers of the pleura. The pathogenesis is discussed, and the possibility that these three cases were related to asbestos is suggested but unproved. (Author's summary)##

08203 37

Bobyleva, A. T., R. M. Bukhantseva, S. E. Lovtsova, and M. S. Sadilova

DUST CONCENTRATION IN RESIDENTIAL DISTRICTS OF ASBEST CITY AND ITS EFFECT ON THE CHILDREN'S HEALTH. Gigiena i Sanit., 23(11):9-12, 1958. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 251-254, Aug. 1960.
CFSTI: TT 60-21913

Air was sampled for asbestos dust at different distances from three asbestos plants during 1950. The air of residential districts was found to be heavily polluted with asbestos dust. A survey was made of morbidity among children living in the area and it was concluded that pollution from the asbestos plants was affecting the health of the children.

15617 38

Bohlig, H.

OCCUPATIONAL AND ENVIRONMENTAL DANGER THROUGH ASBESTOS. (Berufs- und Umgebungsgefaehrdung durch Asbest). Text in German. Deut. Med. Wochschr., 93(32):1529-1531, Aug. 9, 1968. 9 refs. (Includes comments by W. Hess, Deut. Med. Wochschr., 94(23):1253-1254, June 6, 1969.)

Asbestosis is not readily detected with X-rays in its initial stages, although normal functions may already be considerably reduced. As the disease progresses, the lungs restrict, and blood circulation and gas exchange in the lungs begin to malfunction. The disease is frequently accompanied by chronic bronchitis. Unlike silicosis, asbestosis does not stop when all exposure has ceased. The tuberculosis morbidity of persons with asbestosis is equal to those who have never been exposed to asbestos. It is lower than with silicosis patients. (This point was attacked by W. Hess who thinks that asbestosis does seem to enhance tuberculosis. In an answer to this attack, Bohlig claims that the high correlation of asbestosis with tuberculosis in this area is not yet clarified.) Mortality of asbestosis patients is high, and there is hardly any cure. The best help is prevention. And indeed, something has been accomplished in this respect in West Germany. In 1965, 3000 new silicosis cases were listed as compared with only 67 asbestosis cases. Dust elimination reduced the disease, and asbestosis patients can attain old age. Since 1957, a much worse consequence of asbesto dust inhalation has made its appearance, namely lung cancer. Unfortunately it is frequently accompied by malignant mesothelioma of the pleura and peritoneum. Asbestos has become ubiquitous; it is found in brake linings, road pavements, as insulating material, in textiles, synthetics, cardboard paper, and so on. Asbestosis is no longer limited to occupational contact with the material.

10239 39

Bohlig, H.

PATHOLOGICAL SYMPTOMS DUE TO INHALATION OF ASBESTOS DUST. ((Krankheitserscheinungen nach Asbeststaubinhalation.)) Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 16(12):353-355, Dec. 1966.

In a brief literature review, in which authors are mentioned but no references cited, the problem of asbestos dust as a carcinogenic substance is surveyed. Despite greatly increased preventive measures taken in many asbestos plants, and the resultant reductions in cases of asbestosis, problems of asbestos inhalation have acquired new significance during the past five years. The retrospective examination of mesothelioma autopsy material in various countries has implicated asbestos dust as a malignant-tumor inducing agent, not only in asbestos workers but even in others. The well-known 'pleura-plaques' of asbestosis and diffuse mesotheliomas have been observed in individuals who had never had occupational contact with asbestos but who had resided in the vicinity of asbestos plants or mines. It can be stated with assurance that pollution of the ambient air (imission) by asbestos factories - which were relatively late in utilizing the asbestos dust of their dedusting installations instead of simply releasing it to the atmosphere - has been a causative factor in a significant increase in the rate of appearance of both pleural plaques and mesotheliomas. Whether or not the quantities of asbestos dust released into the atmosphere from brake linings of automobiles are also responsible for these malignancies is a question which has yet to be determined; however, asbestos was detected histologically in the lungs of city dwellers not exposed occupationally in the following percentages: Pittsburgh, 41.0%; Miami, 27.9%; Cape Town 26.4%. Individuals endangered by asbestos, in addition to those just cited, include persons who have occasional contact with asbestos in construction or other activities (such as roofers, insulation specialists). The properties of asbestos ores, including their benzopyrene content, are briefly mentioned.##

03312 40

H. Bohlig

RADIOLOGICAL CLASSIFICATION OF PULMONARY ASBESTOSIS. Ann. N.Y. Acad. Sci. 132, 338-50, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Every classification is imperfect, even more so regarding asbestosis. The classifications now in use are not quite identical, but they mainly divide the radiological appearances into three fluently changing stages, of which especially the second is illogically defined and not to be produced efficiently. The fact of a conference taking place at all proves that new international agreements about a practicable classification for pulmonary asbestosis are necessary. If experts agree, that linear opacities are also disseminated shadows and that the radiological appearances of pneumoconioses can be either disseminated or squared opacities, it would seem appropriate to adopt these two kinds of appearances as a base for new classification. Doing so, considerable approximation to already existing classifications would be gained as well. For intensifying the reproducibility of the X-ray film and, on the other hand, enlarging the distinctness of the codified X-ray findings, we suggest not to use the unalterable symbol "L", but to introduce another symbol "f" for linear patterns, chiefly occurring in asbestosis, and to combine it with the quantitative catergories for small opacities. The large opacities might be characterized by the symbol "A" for beginning confluence and by "B" and "C" for opacities having a longer diameter than 5 cm. The additional symbols would be welcome for further accommodation of the findings code to individual, local or national peculiarities. Extensive reconstruction of the radiological appearances, even without the film in question, would be possible when adopting the symbol suggested. It is unimportant whether this proposition is adopted or not; it is exceedingly important, that some international agreement should be attained, which would be really practicable. (Author summary modified)##

07835 41

Borow, Maxwell, Alfred Conston, Lawrence L. Livornese, and Norbert Schalet

MESOTHELIOMA AND ITS ASSOCIATION WITH ASBESTOSIS. J. Am. Med. Assoc., 201(8):587-591, Aug. 21, 1967. 20 refs.

Seventeen cases of mesothelioma, nine of the pleura and eight of the peritoneum which were found at surgery over a three-year period in a community hospital are reported along with a review of the literature of this supposedly rare condition. In this series, the only environmental exposure of two of the patients was that of living in a community adjacent to an asbestos mill. The same hospital has had a high incidence of bronchogenic carcinoma with asbestosis. Since a review of the autopsy material for the last ten years produced only one additional case, it is believed that the incidence of mesothelioma is increasing as is the incidence of asbestosis. The mode of action of asbestos in producing neoplasia is poorly understood. Mesothelioma may be prevalent in one asbestos mining area and absent in another a few miles away. A number of hypotheses as to the cause of mesothelioma re reviewed.

03322 42

W.D. Buchanan

ASBESTOSIS AND PRIMARY INTRATHORACIC NEOPLASMS. Ann. N.Y. Acad. Sci. 132, 507-18, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The findings of a continuing study by the Medical Branch of H.M. Factory Inspectorate, Ministry of Labour, of information recorded on death certificates of persons dying with asbestosis are presented. A review of the literature indicates that the possibility of carcinoma of the lungs or bronchi as a complication had been expressed prior to 1947. Nevertheless, it is believed that the first series in which the incidence of lung carcinoma had been related to a sizeable group of asbestosis deaths was that published in the 1947 Annual Report of the Chief Inspector of Factories. Similar reports followed in 1954 and 1955. Up to the end of 1963, 584 death certificates recording the presence of asbestosis have been obtained and the annual totals of such certificates are currently increasing. The proportion recording a thoracic tumor is also in both sexes continuing to increase disproportionately to the total number, so that currently over 50 per cent of males dying with asbestosis present have also a neoplasm. Data on the mean age at death over various periods of time of male and female asbestosis cases indicate on improving prognosis where the asbestosis is uncomplicated but no significant improvement where complicated by cancer. Suggestions ot account for this and also the yearly increasing total of recorded cases of asbestosis are put forward. The conclusion of the study is that even when viewed against the steadily rising incidence of lung cancer in the population as a whole, there seems little doubt that there is a special risk of an intrathoracic tumor if asbestosis is also present in the lung. (Author summary modified)##

03315 43

A. Caplan, J. C. Gilson, K.F.W. Hinson, J.C. McVittie, J.C. Wagner

A PRELIMINARY STUDY OF OBSERVER VARIATION IN THE CLASSIFICATION OF RADIOGRAPHS OF ASBESTOS-EXPOSED WORKERS AND THE RELATION OF PATHOLOGY AND X-RAY APPEARANCES (PART II OF RADIOLOGICAL AND PATHOLOGICAL CORRELATIONS IN ASBESTOSIS IN THE REPUBLIC OF SOUTH

AFRICA AND THE UNITED KINGDOM). Ann. N.Y. Acad. Sci. 132, 379-86, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

This is a preliminary study of an extended I.L.O. Classification of the radiographs of asbestos-exposed workers, using the techniques for investigating the inter- and intraobserver observations which form part of the basis on which the 1950 and 1958 I.L.O. Classification was constructed. The results of this preliminary study are sufficiently encouraging to warrant an extended investigation with a wider range of films spanning the full range of abnormality, and from a number of different countries and occupational groups (mining, textiles, insulating workers, etc.). This study has shown that it is possible to build on the 1958 I.L.O. Classification a system which promises to be useful for the classification of asbestosis. It is important to emphasize that many asbestos-exposed workers also inhale other types of dust and it would, therefore, seem logical to use a classification describing the results of exposure to a mixture of dusts if possible. There is some evidence that there may be marked differences in the prevalence of, for example, linear markings, pleural thickening, or calcification, etc., in different groups of films from different occupations or racial groups. If this is so, information will be lost by attempting to grade "asbestosis" radiologically without taking into account the separate types of abnormality present. The separate recording of the qualitative differences of radiological appearances on a semiquantitative scale is the scientific principle on which the I.)l.O. Classification is based.##

00734 44

D. Cauna, R.S. Totten, P. Gross

ASBESTOS BODIES IN HUMAN LUNGS AT AUTOPSY. J. Am. Med. Assoc., 192(5):111-113, May 3, 1965.

The incidence of asbestos bodies in the lungs was investigated in 100 autopsies of adults. Lung smears were taken from the sectioned surfaces of the upper and lower lobes of both lungs. The slides were dried and mounted without staining, and approximately 400 low-power fields were examined in each slide. Routine histological sections of unexpanded lungs were also examined in all cases. Asbestos bodies were found in 41% of the subjects. They were not encountered in persons up to 24 years of age. Among males the incidence was 47%, and in females 34%. Although significant microscopic pulmonary fibrosis was encountered in two positive cases, no instance of classical asbestosis was found. Mesothelioma of the pleura was not encountered. Primary lung carcinoma occurred in one patient with asbestos bodies and in one without. (Author's abstract)##

03330 45

J. Churg, S. H. Rosen, and S. Moolten.

HISTOLOGICAL CHARACTERISTICS OF MESOTHELIOMA ASSOCIATED WITH ASBESTOS. Ann. N.Y. Acad. Sci. 132, 614-23, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Cytological and histological features in 30 cases of mesothelioma associated with asbestos exposure are presented. All cases conform to the gross and microscopic criteria for this type of tumor. There are 13 pleural and 1m peritoneal cases. The cytological and histological features were identical in both types. Two variants of tumor cells were seen; epithelium-like and mesenchymal. Epithelium-like cells were found in all 30 cases. In nine of these mesenchymal tumor elements were also present. Several histological patterns could be recognized: papillary, tabular, tubulopapillary, solid, modular, and sheet-like. In the majority of cases several patterns coexisted. Demonstration of acid mucopolysaccharides in association with epithelium-like cells was of diagnostic value. (Author summary modified)##

08097 46

Cooper, W. C.

ASBESTOS AS A HAZARD TO HEALTH. Arch Environ. Health, 15(3):285-290, Sept. 1967. 31 refs. (Presented at the 19th Annual Meeting of the American Academy of Occupational Medicine, San Francisco, Feb. 8, 1967)

With the increasing use and indispensability of asbestos minerals, the hazards must be better defined and controlled. Present standards for dust control do not appear to be adequate to prevent asbestosis over a working lifetime, and many segments of industry, aggressively attacking the problem, have already been using more rigorous standards. The associations between asgestos minerals and malignancies of the lungs, pleura, and peritoneum have become increasingly convincing. Current efforts must be directed toward better definition of the importance of type, size of fiber, and the importance of co-factors. It has been suggested that asbestos fibers act as carriers of carcinogenic metals or other substances to vulnerable sites. The demonstration of ferruginous bodies in from one-quarter to one-half of the lungs examined in consecutive autopsies in a number of the cities around the world points to the need for the positive identification of the mineral fibers that are responsible. If they prove to be asbestos further work will be needed to estimate their significance in terms of human health.##

09911 47

Cralley, Lewis J., Robert G. Keenan, Jeremiah R. Lynch, William S. Lainhart

SOURCE AND IDENTIFICATION OF RESPIRABLE FIBERS. Am. Ind. Hyg. Assoc. J., 29(2):129-135, March-April 1968. 19 refs.

Fibrous bodies with an iron-containing coating have been found in the lungs of persons coming to autopsy in a number of urban hospitals, the number of fibrous bodies varying greatly with approximately 4 to 6 percent of the persons examined showing numerous bodies. Because these findings raise questions with regard to the possibility that asbestos is a factor in increased lung cancer, questions concerning the nature, source, and significance of these bodies are discussed in the light of research needed to find answers. (Authors' abstract)

10241 48

Cuthbert, J.

THE COMMUNITY HAZARDS OF ASBESTOS. ((Die Gefahren des Asbest fur die Allgemeinheit.)) Text in German. Muench. Med. Wochschr. (Munich), 109:1369-1372, April-June 1967.

The inhalation of asbestos is far more dangerous than is generally recognized by the public, since even a transient period of exposure can lead to disease (interstitial fibrosis of the lung, lung cancer, mesothelioma, endothelioma of the pleura and the peritoneum, painful dermal warts) and death many years later. Electron microscopic studies have shown that for every asbestos fiber recognizable under an ordinary (light) microscope, there are hundreds of tiny unrecognized particles, which dust experiments with guinea pigs have shown to be just as deadly as the larger fibers. While the asbestos industry has taken energetic measures toward the prevention of classical forms of asbestosis by dust elimination in its plants (vacuum removal of the dust, use of gas masks, automation of manufacturing processes), such prophylactic measures have not prevented the gradual long-term development of cancer in persons who come into occasional, slight, or temporary contact with asbestos. This group certainly includes wives of asbestos workers and all persons living within 1.5 km. of an asbestos plant; these persons tend to succumb to mesothelioma after many years of such contact. A number of examples are given, including those of carpenters and construction workers, who do not realize that their relatively brief contact in sawing or handling asbestos materials can lead to lung cancer many years later. The great increase in asbestos production and in asbestosis in recent years is tabulated; the need for utilization of alternate materials in industry, and for further research on biological effects is emphasized. The presence in asbestos of carcinogenic oils and other components, including benzopyrene and chromium, is mentioned.

07816 49

Davis, J. M. G.

THE EFFECTS OF CHRYSOTILE ASBESTOS DUST ON LUNG MACROPHAGES MAINTAINED IN ORGAN CULTURE. AN ELECTRON MICROSCOPE STUDY. Brit. J. Exp. Pathol. (London), 48(4):379-385, Aug. 1967. 8 refs.

The effect of asbestos dust on human lungs was simulated by injecting chrysotile asbestos dust into small pieces of adult guinea-pig lung maintained in organ culture for 10-14 days. The dust was well distributed from the original injection site and was quickly taken up by the lung macrophages. Dust was not found in any of the other cells. The macrophages in a dusted area developed elongated phagocytic processes on their surface membranes and encircled the dust and folded back onto the cell to form phagocytic vacuoles or phagosomes. If the dust remained in a phagosome it eventually contracted to form giant cells, and eventually some became converted into fibroblasts with asbestos dust still retained in the fibroblast cytoplasm. The asbestos dust in macrophages is either finally liberated into the cytoplasm, or more usually, walled up in residual bodies. This study confirmed that giant cell formation does not necessarily result from the presence of foreign material too large to be phagocytosed by a single macrophage. The pathological changes previously reported for live guinea-pigs exposed to dust can all be produced in pieces of lung maintained in organ culture.##

03302 50

J.M.G. Davis

ELECTRON-MICROSCOPE STUDIES OF ASBESTOSIS IN MAN AND ANIMALS. Ann. N.Y. Acad. Sci. 132, 98-111, Dec. 31, 1965. Also published in Med. Lavoro 56, (6-7) 521-9, July 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

In summary the electron-microscope examination of lung material containing asbestos dust has produced the following interesting or promising information. Some workers have in the past suggested that only relatively large fibers of asbestos dust were able to produce damage in the lung and concluded that very small dust particles were comparatively unimportant. These electron-microscope studies have shown that the bulk of the dust that is able to get into both human and guinea pig lungs has a very small porticle size and indeed much of it is below 1 micron in length. The importances of this small particle dust in the pathogensis of asbestosis cannot therefore be ignored, and experiments are now being undertaken in which animals are being treated with only fine particles of asbestos dust. Preliminary results suggest that it may be just as damaging as dust containing both large and small particles. From these electron-microscope studies, it seems that asbestosis is basically an intracellular process and that the alveolar macrophages and their derivatives are the only cells directly involved. Although all sizes of dust can be coated, however, the electron-microscope has also shown that some dust can remain in the lung for long periods without becoming coated, and it is even possible for different ends of the same fiber to react differently. It is commonly thought that the asbestos body coating may protect the tissue from the harmful effects of the dust, and if this is true it is logical to suggest that it is the dust that is not coated and that perhaps cannot be coated that causes the damage. If this is so then further work should be concentrated on the chemistry of ferritin deposition onto asbestos dust.##

09052 51

Demy, Nicholas G. and Howard Adler

ASBESTOSIS AND MALGINANCY. Am. J. Roengenol. Radium Therapy Nucl. Med., 100(3):597-602, July 1967. 16 refs. (Presented at the 67th Annual Meeting, American Roengen Ray Society, San Francisco, Calif., Sept. 27-30, 1966.)

Historical background, pathogenesis, and pathological and clinical evidence are discussed. The material is based on 20 years' experience with asbestosis in a community where three industries employing 5,000 men and women use asbestos in processing various articles. The occupational histories were obtained from the patients or their doctors. The industries declined information other than that the patients had been employed there and even this information was sometimes faulty. The majority of the 47 patients with malignancy had long occupational exposures varying from 15 to more than 25 years. The youngest patient with pulmonary tumor was 38, the oldest 78; the youngest mesothelioma patient was 40, the oldest 89. The pulmonary tumors were generally in patients over 60; the mesothelial tumors were generally in younger patients. In general, the latent period was longer than 20 years.##

10594 52

Donna, A. and A.P.M. Cappa

AN EXPERIMENTAL CONTRIBUTION TO THE STUDY OF PNEUMOCONIOSIS BY ASBESTOS. PNEUMOCONIOTIC ACTIVITY OF CHRYSOTILE ASBESTOS IN THE RAT. (Contributo sperimentale allo studio della pneumoconiosi da asbesto. Attivitta' pneumoconiotica dell'asbesto di crisotilo nel ratto.) Text in Italian. Med. Lavoro (Milan), 58(1):1-12, Jan. 1967. 19 refs.

Using a technique based on dust inhalation, and containing about 60,000 particles per ml air, 38 male albino rats (Sprague-Dawley) were exposed to asbestos for 12-360 hrs. Some animals died after various periods of exposure: the first two immediately, the last pair after 580 days (after a second exposure of 360 hrs.). Apparently, asbestos particles under 20 microns are fibrogenic in limited nodular zones (groups of alvioli): these zones are affected as are sites different from those which are not affected in man (lumph nodes). The fibrogenic activity of the dust depends on the length of fibers; dusts under 20 microns may be eliminated by the airways and are thought to induce fibrosis only in the limited sites where they can remain.##

10746 53

Dunn, John E. Jr., and John M. Weir

A PROSPECTIVE STUDY OF MORTALITY OF SEVERAL OCCUPATIONAL GROUPS. SPECIAL EMPHASIS ON LUNG CANCER. Arch. Environ. Health, 17(1):71-76, July 1968.

The study was primarily concerned with the risk of lung cancer in certain occupations. One occupation, asbestos workers, was found to have a definite increased risk of lung cancer, and the risk increased with length of time in the occupation. No other occupation was found to have increased lung cancer hazard. Other causes of mortality were not found related to these occupations except for two groups that had excess mortality from both cancers of the mouth, pharynx, and larynx and from cirrhosis of the liver. These diseases are associated with alcohol consumption, and this is the most likely explanation. The problems involved in the case control and prospective study sequence are discussed. Also the possible masking effect of such a powerful etiologic factor as cigarette smoking is discussed. (Authors' abstract)**

06542 54

Elmes, P. C., W. T. E. McCaughey, and O. L. Wade

DIFFUSE MESOTHELIOMA OF THE PLEURA AND ASBESTOS. Brit. Med. J. (London), Vol. 1, p. 350-353, Feb. 6, 1965. 17 refs.

A history of occupational exposure to asbestos was obtained in 32 out of 42 patients with mesothelioma of the pleura in Belfast. In 42 matched control patients of the same age and sex, a history of exposure was obtained in only nine. Asbestos bodies were found at necropsy in the lungs of about 27% of men aged 50 to 69 dying recently of diseases other than carcinoma of the bronchus and mesothelioma of the pleura. Asbestos bodies were found in the lungs of about 20% of patients dying with carcinoma of the lung. They were found in more than 80% of men dying of mesothelioma of the pleura. A history of industrial occupation with exposure to asbestos was obtained from relatives, neighbors, or friends of about three-quarters of patients in whom asbestos bodies were found in the lungs at necropsy. Such a history was obtained for one-quarter of patients in whom asbestos bodies were found in the lungs at necropsy. It is concluded that there is evidence that exposure to asbestos, even though it may have been transient and many years serious, is an important factor in the aetiology of mesothelioma of the pleura. This conclusion gives cause for anxiety because of the increasing commercial use of asbestos. (Authors' summary, modified)**

03325 55

P. C. Elmes and O. L. Wade.

RELATIONSHIP BETWEEN EXPOSURE TO ASBESTOS AND PLEURAL MALIGNANCY IN BELFAST. Ann. N. Y. Acad. Sci. 132, 549-57, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

A study of 43 cases in Belfast has revealed a relationship between exposure to asbestos at work and the development of mesothelial tumors of the pleura. Evidence has been produced which indicated that the exposure associated with this tumor need not be severe or prolonged, and that as many as a quarter of the male population of this area may have received sufficient exposure. Among asbestos workers carcinoma of the lung is at least as frequent a cause of death as mesothelioma but the increasing widespread use of asbestos may be exposing a wide section of the population to the risk of secondary neoplasis. (Author summary)##

00777 56

P.E. Enterline

MORTALITY AMONG ASBESTOS PRODUCTS WORKERS IN THE UNITED STATES. Ann. N.Y. Acad. Sci. Vol. 132, 156-165, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City Oct. 19-21, 1964.)

This is a report of deaths and causes of deaths among 2,833 white men at ages 15-64 who worked in the asbestos products industry at some time during the period 1948-51, the bulk of whom were working in the asbestos textile industry. To assist in evaluating these data comparable information is presented for workers in the cotton textile industry.##

08098 57

Enterline, Philip E., and Mildred A. Kendrick

ASBESTOS-DUST EXPOSURE AT VARIOUS LEVELS AND MORTALITY. Arch. Environ. Health, 15(2):181-186, Aug. 1967. 11 refs.

A wide variety of studies have shown an association between asbestos dust exposures and certain diseases. The mortality experience of 21,755 white males in three asbestos products industries were studied and comparisons were made with the mortality experience of 6,281 white males in an industry without asbestos dust exposures and with the mortality experience of the entire U. S. white male population. An elevated death rate for all causes was found only among workers in the asbestos textile industry, an industry which has probably had heavy asbestos dust exposure. The other two asbestos products industries-- asbestos building products and asbestos friction materials-- probably had considerably lower levels of asbestos-dust exposure, and here death rates for all causes were below those experienced in all U. S. white males, and nearly identical to those among workers in the industry without asbestos-dust exposures. It is believed that asbestos-dust exposures among workers in the building products industry and the asbestos friction materials industry greatly exceed those in modern urban communities, and that the modest response of the workers in these industries indicates that asbestos dust at levels to which general populations are exposed probably is of little importance in the etiology of the disease. (Authors| summary, modified)

08231 58

EXPOSURE TO ASBESTOS AND MALIGNANCY. London Clin. Med J., 7(1):10-13, Jan. 1966

Inhalation of asbestos fibres results in the formation of characteristic 'asbestos bodies'+ within the lung, fibres are coated with an iron protein complex to give refractile, amber structures of elongated, beadlike form often with bulbous ends. These asbestos bodies may be identified in the sputum, in smears of lung fluid, and in sections of lung tissue. Recent surveys have shown asbestos bodies to be present in many of the otherwise normal lungs of those living in clean, non-industrial communities, suggesting that environmental contamination with asbestos dust is widespread. Prominence has been given recently to the relationship between asbestos exposure and mesothelioma. Mesothelioma may be strongly suspected from cytological examination of serous fluids and biopsy material, but only a full autopsy with the exclusion of any other primary neoplasm will allow the pathologist to make a really confident diagnosis. Many lungs of such cases, while containing asbestos bodies, may show little or no evidence of pulmonary fibrosis. While exposure to dust is greatest in those employed in mining or processing asbestos, many other trades come into contact with asbestos products. Lesser degrees of exposure to dust have also been demonstrated in those living in the vicinity of asbestos mines or factories. Possible widespread community contamination by asbestos clearly calls for a full assessment of its carcinogenic properties. Both crysotile and crocidolite have been associated with bronchial carcinoma and mesothelioma, but amosite has not. It follows that both qualitative and quantative analyses of asbestos in tissues could be most helpful in the further elucidation of this problem. In addition, the relationship between asbestos exposure, smoking, and neoplasia requires analysis.

11721 59

Pitschen, W. and I. Webster

EXPERIMENTAL MODEL SYSTEMS OF PNEUMOCONIOSIS. I. THE EFFECT OF DUSTS ON SUBCUTANEOUS SPONGE IMPLANTS IN THE RAT. Med. Lavoro (Milan), 59(3):161-167, March 1968. 22 refs.

A study of the pathogenesis of pneumoconiosis at the subcellular level has been hampered by the lack of a suitable model system. A system using an Ivalon sponge impregnated with silica, crocidolite, or rutile dusts and implanted subcutaneously in rats is described. The addition of 10 mg silica to the sponge had no effect on collagen biosynthesis. As compared to controls, 50 mg silica increased two fold the rate of collagen biosynthesis, 40 to 80 days following implantation. The same amounts of rutile and crocidolite had no effect, although the crocidolite-treated sponges showed histological changes indicative of a fibrous reaction which was absent from animals treated with rutile. Fibrous crocidolite dust is known to be fibrogenic and the lack of response may be due to the very small number of fibers in the sample.##

07819 60

Freundlich, Irvin M., and Roy R. Greening

ASBESTOSIS AND ASSOCIATED MEDICAL PROBLEMS. Radiology, 89(2):224-229, Aug. 1967. 53 refs.

Radiological studies of 187 asbestos workers employed in various insulating trades showed that about 30% had some pulmonary change which could be ascribed to the inhalation of asbestos dust. No lung biopsies were performed. The pathological changes observed are summarized in a table. A total of 56/187 (29.9%) showed pleural thickening and/or interstitial fibrosis. Of these, 27 had pleural thickening only, 6 had parenchymal fibrosis, and 23 had both pleural thickening and parenchymal fibrosis. Typical roentgenologic findings are illustrated. These observations are discussed in terms of a literature review (53 references). Various reports from the literature, indicating an increased incidence of bronchogenic carcinoma and mesothelioma in asbestos workers, were summarized, and asbestos as a possible urban hazard was discussed.##

13455 61

Gaensler, Edward A. and Whitney W. Addington

ASBESTOS OR FERRUGINOUS BODIES. New England J. Med., 280(9):488-492, Feb. 1969. 27 refs.

The incidence of asbestos pneumoconiosis (asbestosis) and asbestos-related neoplasms has increased alarmingly, due to the rapidly rising use of asbestos in industry with inadequate controls. The current concepts of asbestos bodies found in asbestosis are reviewed. Asbestos bodies are yellowish rods coated with ferritine granules and are found within the aveoli. Many other substances have been found to produce bodies of similar appearance but without a core of asbestos. These should all be labeled ferruginous bodies until further study is done. Core sources are found in urban atmosphere and are possibly emitted from automobile braking linings. Prevalence of such bodies is form 26-98% in post-mortem material, but there was found to be no relation between the number of bodies found and the severity of asbestos pneumoconiosis.

03335 62

J. C. Gilson.

PROBLEMS AND PERSPECTIVES: THE CHANGING HAZARDS OF EXPOSURE TO ASBESTOS. Ann. N.Y. Acad. Sci. 132, 696-705, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Evidence presented at the Conference indicated that in the future much greater care must be taken to eliminate unnecessary exposure to asbestos dust wherever it occurs. This is going to be a big problem and one in which hopefully the engineers, physicists, industrial medical officers, and epidemiologists will unite to establish evidence of progress towards the ideal of eliminating all the specific diseases due to asbestos, and yet retaining and developing further the many uses of asbestos which contribute so much to health and safety. (Author conclusions modified)##

08280 63

Gold, Charles and James Cuthbert

ASBESTOS - A HAZARD TO THE COMMUNITY. Public Health (London), 80(6):261-270, Sept. 1966. 14 refs.

During a recent study of pulmonary fibrosis in a Southeast Glasgow clinic, 21 proven cases and 3 possible cases of lung pathology associated with exposure to asbestos have come to light. A patient with suspected asbestosis should have, in addition to X-rays, an examination for asbestos bodies in the sputum, lung function tests, and open lung biopsy, since asbestosis has been proven in patients with normal or borderline X-rays by the lung function test and most reliably by lung biopsy. It is also important to take a complete occupational history in cases of obscure pulmonary fibrosis, since asbestosis or pleura tumors may occur many years after a short exposure to the asbestos dust. Also, persons in occupations usually not associated with health hazards may be endangered by working in close proximity with people who use asbestos, especially in confined spaces. Case histories are given and a table is presented showing the type of asbestosis, occupation, length of exposure, age, and period elapsed since exposure of the 24 patients studied. Since the use of asbestos has become more widespread in recent years, it is recommended that possible alternative materials to asbestos should be used whenever possible. The proposal to mix asbestos with tarmacadam for road use is viewed with concern.##

03313 64

J. Gough

DIFFERENTIAL DIAGNOSIS IN THE PATHOLOGY OF ASBESTOSIS. Ann. N.Y. Acad. Sci. 132, 368-72, Dec. 31, 1965.
the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Asbestosis occurs in two anatomical forms - diffuse and solid fibrosis. The diffuse form leads to honeycomb (Cystic) lung. In the diagnosis, distinction is made from other forms of honeycomb lung. Differentiation of asbestosis from fibrosis due to other silicates is not difficult. Hemosiderosis of elastic tissue (elastosis bodies) may mimic asbestos bodies. (Author summary)##

20843 65

Gross, Paul, Robert T. P. deTreville, and Martin N. Haller

ASBESTOS VERSUS NONASBESTOS FIBERS. Arch. Environ. Health, 20(5):571-578, May 1970. 12 refs.

The inhalation of air polluted with asbestos dust may be responsible for asbestotic pulmonary fibrosis, increased prevalence of lung cancer, and mesothelioma. A number of fibrous dusts other than asbestos can produce ferruginous bodies in the lungs, so the presence of these bodies is not necessarily an index of asbestos pollution. To determine the extent of exposure to asbestos dust, it is necessary to indentify the naked fibers and central cores of ferruginous bodies isolated from lungs of urban dwellers. The fractured end of asbestos fiber is irregular with step-like projections, while fibers other than asbestos present smooth profiles. Another important difference is the longitudinal, parallel delineation of individual fibrils of asbestos when viewed at a magnification of twenty thousand times. The view of a nonasbestos, fiber is devoid of such longitudinal lines. Fibers with diameters from two micron down to one tenth of one micron were successfully identified. Asbestos fibers come from industrial products such as chrysotile and amosite, as well as from cosmetic and dusting powders. The method presented is less time-consuming and more economical than the electron diffraction and electron microprobe analysis techniques.

16757 66

Gross, Paul, Robert T. P. deTreville, and Martin N. Haller

PULMONARY FERRUGINOUS BODIES IN CITY DWELLERS. Arch. Environ. Health, 19(2):186-188, Aug. 1969. 9 refs.

Chrysotile, which comprises more than 90% of the asbestos used in this country, has a characteristic electron diffraction pattern because of its unique, hollow, tubular, crystalline structure, as seen under the electron microscope. On the basis of the electron diffraction pattern, chrysotile was decisively excluded as a constituent of the cores of all 28 ferruginous bodies isolated from lungs of urban dwellers not occupationally exposed to asbestos. This exclusion is considered highly significant because if the ferruginous bodies in the above city dwellers had been caused by the inhalation of asbestos dust, then some of the cores should logically be composed of chrysotile. (Author's Abstract)

06057 67

P. Gross and B. Tolker

DUST PARTICLES IN LUNG SECTIONS (SOME NOTES ON METHODS OF THEIR VISUALIZATION). Arch. Environ. Health 12 (2), 213-216 (Feb. 1966).

The microscopic examination of cleared, unstained sections of lung tissue with dry objectives and dark-field illumination will give a view of the amount and distribution of many dusts that may otherwise be obscured by cytologic constituents. Although formaldehyde precipitate and hemosiderin may confuse such study, these sources of confusion are readily removed. Despite the applicability of this technique to the study of many opaque dusts, such as coal, antimony trioxide, aluminum, iron oxide, and others, silica and silicates cannot be visualized in this manner. The microincineration technique is still the best method for the study of the latter dusts. The limitations of techniques using microincineration or polarized light for the study of dust in sections are cited. Asbestos bodies and coarse asbestos fibers are readily visualized with dark-field illumination in cleared unstained sections. An alternate method for demonstrating asbestos bodies is the Prussian blue reaction for iron. (Authors' summary)##

10086 68

Hagerstrand, I., L. Meurman, and B. Odlund

ASBESTOS BODIES IN THE LUNGS AND MESOTHELIOMA. A RETROSPECTIVE EXAMINATION OF A TEN YEAR-AUTOPSY MATERIAL. Acta Pathol. Microbiol. Scand. (Copenhagen) 72(2): 177-191, 1968. 24 refs

In 12,763 autopsies performed during 1957-1966 at the General Hospital, Malmo, Sweden, 35 cases of mesothelioma were found (27 of the pleura, 8 of the peritoneum) for a frequency of 0.275 (0.35 if children under 15 years of age are excluded). Of these, 34 were re examined for the presence of asbestos bodies in the lungs and data compared with data from a matched control group. Asbestos bodies were found in 15 of 26 cases of pleural mesothelioma; a few bodies were found in most cases, but bodies were numerous (more than 20, about 70 micron long) in four. No cases showed pulmonary fibrosis. In the controls, asbestos bodies were found in ten cases, but never in large numbers. Asbestos bodies were found in three of the eight cases of peritoneal mesothelioma; in two, bodies were numerous. Only one of the controls had many asbestos bodies. Of the 15 cases suspected of asbestosis, only one showed advanced pulmonary fibrosis and numerous asbestos bodies.

01397 69

E.C. Hammond, I.J. Selikoff, J. Churg

NEOPLASIA AMONG INSULATION WORKERS IN THE UNITED STATES WITH SPECIAL REFERENCE TO INTRA-ABDOMINAL NEOPLASIA. Ann. N. Y. Acad. Sci., Vol. 132:519-525, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Authors present statistics (from 1908 to 1964) to show the mortality among males working in an environment of dust (asbestos). Cause of death is given for workers with an emphasis on mortality induced by cancer; cancer of the lung and pleura and cancer of the stomach and colon. The authors conclude that light exposure to asbestos dust does not lead rapidly to pulmonary neoplasia (i.e. tumor). Equally obviously, this disease is unlikely to appear if workers die at a young age due to some other effect of asbestos exposure. However, with light exposure and availability of antibiotics for the treatment of infectious disease, neoplasia (i.e. tumor) is a major cause of death of such workers.##

00585 70

H.L. Hardy

ASBESTOS RELATED DISEASE. Am J. Med. Sci., 250(4):49/381-57/389, Oct. 1965. (Presented at the

Annual Meeting, Association of American Physicians, Atlantic City, N. J., May 4, 1965.)

Four cases of asbestos related disease have been briefly described. Together with past and presently accumulating evidence, epidemiologic and experimental, these cases illustrate the potential hazard posed by asbestos exposure to both worker and neighbor. The purpose of this report is to interest clinicians in the harmful biologic effects of asbestos already documented. Evidence is impressive that asbestos exposure, often delayed in effect, will in the future be responsible for an important amount of pulmonary disease, especially chest tumors. In addition, new evidence points to asbestos exposure as significantly associated with abdominal tumors as well. (Author's summary)##

01467 71

J. S. Harington

CHEMICAL STUDIES OF ASBESTOS. Ann. N.Y. Acad. Sci., Vol. 132:31-47, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The present paper reports the results of chemical investigations of the organic matter and metals in different types of asbestos. The primary oils which exist in natural association with crocidolite and amosite have been found to occur in larger amounts than reported earlier, although the content of benzo(a)pyrene and other polycyclic aromatic hydrocarbons remains low. Secondary oils, the composition of which is fairly well known, may contaminate asbestos in various ways. Insulation materials, recently shown to be a carcinogenic hazard to workers handling them, also contain considerable amounts of extractable materials though their significance, like that of the asbestos oils, is at present unknown. The possibility that metal constituents may play a role in asbestos carcinogenesis was suggested by the results of the spectrochemical analysis of the three main types of asbestos, and by their chemical composition. Consideration was also given to the possibility that radioactivity may play some part in the carcinogenic process.##

03319 72

J.S. Harington F.J.C. Roe

STUDIES OF CARCINOGENESIS OF ASBESTOSIS FIBERS AND THEIR NATURAL OILS. Ann. N.Y. Acad Sci. 132, 439-50, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Recent epidemiological studies on lung cancer and mesothelioma have revitalized the subject of the mechanism of carcinogenesis by asbestos. In this paper possible mechanisms of carcinogensis, and experimental methods of elucidating them, are considered from a biological standpoint.

The significance of oils naturally present in asbestos and of oils purposely or accidentally added to it, and the possible role of metal constituents, are discussed in some detail. It is regarded as unlikely that asbestos carcinogenesis is an example of the Oppenheimer Effect. (Author summary modified)##

07783 73

Harington, J. S. and Marianne Smith

STUDIES OF HYDROCARBONS ON MINERAL DUSTS: THE ELUTION OF 3:4 BENZPYRENE AND OILS FROM ASBESTOS AND COAL DUSTS BY SERUM. Arch. Environ. Health, 8(3):453-458, March 1964. 12 refs.

The effectiveness of serum to remove 3-4 benzopyrene and oil from asbestos and coal was investigated. The material examined consisted of virgin crocidolite, amosite, and chrysotile from South African asbestos fields. The following experiments were performed: 1. The Adsorption of 3:4 Benzpyrene on Washed Asbestos and Coal Dust. 2. The Elution of Freshly Adsorbed 3:4-Benzpyrene from Washed Crocidolite, Chrysotile, and Coal Dust by Serum. 3. The Elution of 3:4-Benzpyrene From Natural Crocidolite and Coal Dust by Serum. Chrysotile asbestos adsorbed 100% 3:4-benzpyrene from solution after 48 hours at 37 C compared with 40% and 47% for crocidolite and coal, respectively, and 10% for amosite. No correlation was found between the degree of adsorption of 3:4-benzpyrene and the extent to which it was eluted by serum. Serum eluted the naturally occurring oils more effectively from coal dust than it did from crocidolite fiber and was slightly more effective than cyclohexane in eluting 3:4-benzpyrene from coal and crocidolite. 3:4 Benzpyrene was eluted more easily from |natural| coal and crocidolite than it was after it had been freshly adsorbed on dusts previously freed of their naturally associated hydrocarbons. These findings are discussed in relation to the pathogenesis of coal workers| pneumoconiosis and asbestos malignancy.

00704 74

HEALTH HAZARDS OF ASBESTOS. Lancet 1(7436):530-1, March 5, 1966.

The asbestos industry has become faced with a new type of tumor. Convincing evidence from many countries associates diffuse mesothelial tumors of the pleura and peritoneum with past exposure to asbestos. Investigation of this new hazard and rigorous steps to eliminate all heavy or unnecessary exposure are considered essential.##

07423 75

Heimann, H.

STATUS OF AIR POLLUTION HEALTH RESEARCH, 1966. Arch. Environ.
Health, 14(3):488-503, Mar. 1967. 178 red
Health, 14(3):488-503, Mar. 1967. 178 refs. (Presented in part
before the American Industrial Hygiene Conference,
Pittsburgh, Pa., May 16-20, 1966.)

Consideration is limited to man-made air pollutants, omitting naturally occurring adventitious airborne materials. Radioactive materials were not discussed. Acute episodes of air pollution; systemic effects of air pollution caused by arsenical compounds, mercury, beryllium, lead, carbon monoxide, economic poisons, manganese, and asbestos; air pollutants as irritants; medical conditions such as acute nonspecific upper respiratory disease, chronic obstructive ventilatory diseases, chronic bronchitis, pulmonary emphysema, bronchial asthma, and lung cancer, are reviewed.##

08240 76

Holt, P. F., J. Mills, and D. K. Young

THE EARLY EFFECTS OF CHRYSOTILE ASBESTOS DUST ON THE RAT LUNG. J. Pathol. Bacteriol., Vol. 87, p. 15-23, (jan. 1964. 11 refs.

Chrysotile dust of small particle size (less than 3 microns rapidly produces fibrotic lesions in the lungs when inhaled by rats. It is suggested that asbestos is fibrogenic only when it can be ingested by phagocytes. The rapid fibrosis that can occur some years after asbestos has been inhaled by man may be due to the breakdown into large numbers of small fragments of fibres; these are then phagocytosed. Alternatively the small particles originally inhaled may act slowly and their effect may be enhanced by a superimposed infection. An apparatus that maintains an atmosphere containing small asbestos fibres at nearly constant concentration is described. (Authors' summary)##

01468 77

P. F. Holt, J. Mills, and D. K. Young

EXPERIMENTAL ASBESTOSIS WITH FOUR TYPES OF FIBERS: IMPORTANCE OF SMALL PARTICLES. Ann. N.Y. Acad. Sci., Vol. 132:87-97, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

This paper is concerned with the changes in the lungs of guinea pigs that have been exposed to four kinds of asbestos dust-chrysotile, crocidolite, amosite, and anthophylite. The guinea pig lung reacts immediately to inhalation of asbestos dust. There is a bronchiolitis with extension of the inflammatory reaction to the adjacent alveoli. At a later stage there is a widespread and progressive fibrosis of the lung, adenoid proliferation of the bronchiolar epithelium, and reticulinosis and fibrosis of the tracheal lymph glands. The inhaled dust early becomes coated with an iron-containing protein to form asbestos bodies. These have been recognized within seven days of exposure to the dust. Fine dust particles, too small to be seen under the light microscopr, will produce asbestosis in the guinea pig. The difficulty of controlling the spread of dust has been demonstrated. (Author summary modified)##

03332 78

D. O. B. HOURIHANE

A BIOPSY SERIES OF MESOTHELIOMATA, AND ATTEMPTS TO IDENTIFY ASBESTOS WITHIN SOME OF THE TUMORS. Ann. N.Y. Acad. Sci. 132, 647-73, Dec. 31, 1955 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

A survey of histological material at a single hospital revealed 84 acceptable mesotheliomata which had been diagnosed over a period of ten years. The histological diagnosis on biopsy material is reasonably accurate, and the proportion of error should be less than five per cent. Asbestos bodies are found in the lungs of sputum of the majority of patients who have been diagnosed as having mesotheliomata. Asbestos fibers are found within the mesotheliomatous tissue in about one quarter of the cases, and in about one half of the cases if only patients with asbestosis are considered. (Author summary)##

05999 79

D. O'B. Hourihane, L. Lessof, and P. C. Richardson

HYALINE AND CALCIFIED PLEURAL PLAQUES AS AN INDEX OF EXPOSURE TO ASBESTOS (A STUDY OF RADIOLOGICAL AND PATHOLOGICAL FEATURES OF 100 CASES WITH A CONSIDERATION OF EPIDEMIOLOGY). Brit. Med. J. 1 (5495), 1069-74 (Apr. 30, 1966).

A close association between exposure to asbestos and the development of pleural plaques has been shown. A cause-and-effect relationship is probable. The most extensive lesions are radiologically detectable, and the disease asbestosis is then also present, despite the absence of any other radiological abnormality. The sources of asbestos are considered and evidence is presented to suggest that there is a widespread non-industrial community exposure. Mesotheliomata are common in patients with pleural plaques, and it is suggested that there is a dose-response realtionship between the asbestos and the development of these neoplasms. The question of a relationship between lung cancer and asbestos is left open, but the value of radiological surveys for pleural plaques is emphasized in any study of this problem. Asbestos is not the sole cause of pleural plaques, but it is certainly the most common. (Author summary)##

02288 80

W.C. Hueper

ENVIRONMENTAL AND OCCUPATIONAL CANCER HAZARDS. PART I OF SYMPOSIUM: CHEMICAL CARCINOGENESIS. Clin. Pharmacol. Therap. 3, (6) 776-813, Dec. 1962

The growth of an environmental carcinogenic spectrum composed of recognized, suspected, and potential human carcinogens of chemical, physical, and parasitic nature should provide an impressive warning to all concerned with the maintenance and protection of the health and well-being of mankind to exert all possible effort to develop methods and facilities by which sources of production, channels of dissemination, routes of exposure, prospective and actual target organs and tissues, and number and types of individuals exposed to natural and man-made carcinogens can be more readily and reliably identified. It is essential that, where possible, human contact with environmental carcinogens be totally eliminated or, whenever such a stringent measure appears impractical or impossible, reduced to a minimum with respect to degree, frequency, duration, and number of persons exposed. While the presently available methods of identifying carcinogenic agents are admittedly slow and not totally adequate, experimental observations and their implications in man demand that first and dominant consideration be given to the protection of the community against actual or potential cancer hazards. In such a decision, the health and life of the general public should receive the benefit of doubt without any reservation. (Author summary modified)##

08241 81

Hueper, W. C.

METHODOLOGIC EXPLORATIONS IN EXPERIMENTAL RESPIRATORY CARCINOGENESIS. Arzneimittel-Forsch, Vol. 14, p. 814-822, July 1964. ((84)) refs.

The study, by bioassay methods, of chemicals introduced during the past 30 years into the human environment or to be introduced in the future into the human economy, for carciogenic effects on the respiratory organs, is assuming increasing importance for the following reasons. The rapid rise in the frequency of lung cancers among the populations of all industralized countries since the turn of the century indicates that new and potent man-made respiratory carcinogens have entered the human environment. This epidemiologic phenomenon has been associated with the recognition of a growing number of occupational carcinogens to which large worker groups become exposed and which in part also pollute the general atmosphere and thus act increasingly on the general population. Additional and epidemiologic and experimental evidence incriminates an appreciable number of other chemicals as respiratory carcinogens, some of which are evidently operating following their introduction into the organism by various non-respiratory routes. The thereby demonstrated polyetiology of lung cancers in man and animals militates strongly against a blind acceptance of the widely propagandized scientifically unsound and sociologically irresponsible allegation that cigarette smoking is the proven predominant cause of lung cancer and that, therefore, the control of pulmonary cancer hazards can largely be achieved by simply reducing the consumption of cigarettes and by technologic decarcinogenization of cigarette smoke. Despite the various shortcomings in the presently available bioassay methods for testing chemicals for possible carcinogenic effects on the respiratory organs, their wide application nevertheless provides effective safeguards against a further dissemination of these agents. AS##

01365 82

W.C. Hueper

OCCUPATIONAL AND NONOCCUPATIONAL EXPOSURES TO ASBESTOS. IV. HUMAN EXPOSURE TO ASBESTOS: COMMUNITY STUDIES. Ann. N.Y. Acad. Sci., Vol. 132:184-195, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Information on the number and variety of exposed workers and on the occurrence and incidence of asbestosis and of asbestos cancers among them is most fragmentary in all countries, especially in the United States and Canada, one being the principal consumer of asbestos and the other chief producer of this mineral. It is for this reason regrettable that the original plan of having a recent epidemiologic survey on these aspects of asbestos production in Canadian mines and mills to be undertaken under the aegis of the National Cancer Institute of Canada was not adhered to and that this study was carried out as an industry-dominated venture which yielded highly controversial negative results. The principal worker groups exposed to respiratory contact with asbestos are employed in the asbestos mining and milling industries, in the production and commercial use of asbestos cement and plaster and their numerous secondary products, in the production and application of asbestos for insulating purposes, and in the processing of asbestos and its manufacture into textiles. Because in many countries and states the workmen's compensation laws are defective, the protection of asbestos workers against occupational health hazards related to respiratory and cutaneous contact with asbestos is inadequate. (Author conclusion modified)**

03317 83

R. Hunt

ROUTINE LUNG FUNCTION STUDIES ON 830 EMPLOYEES IN AN ASBESTOS PROCESSING FACTORY. Ann. N. Y. Acad. Sc. 132, 406-20, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

This work is in its early stages, and it is not therefore possible to assess it value fully or accurately. Authors believe that they have established the value of, and indeed the need for, lung function studies both as a pre-employment screen, and as a check on the health of workers exposed to asbestos dust. In particular, they have confirmed the findings of other workers, namely that asbestosis can be detected by lung function studies before it shows in X-ray films. At more advanced stages of asbestosis the lung function results correlate very well with X-ray findings and clinical tests. As a result of the correlation of lung function findings from 1960 onwards with the X-ray results of 1963-64, many personnel are being removed from exposure even though their X-rays were considered apparently negative for asbestosis. This work will continue as a routine examination and as a condition of employment. It is also intended to continue tests with persons who have been removed from exposure in order to follow any changes which may occur. There is some evidence already that men removed from exposure four to five years ago, when the signs of the disease were minimal, are maintaining a reasonable functional level compared with similar men who remained in "exposed" departments. (Author conclusions)##

03324 84

G. Jacob M. Anspach

PULMONARY NEOPLASIS AMONG DRESDEN ASBESTOS WORKERS. Ann. N.Y. Acad. Sci. 132, 536-48, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Problems of asbestosis and its complications have been reinvestigated among workers in the Dresden asbestos industry. In this study the question of lung cancer associated with asbestosis was critically examined with reference to the observations available in Dresden. Although it was emphasized that the conclusions reached did not warrant removal of lung cancer associated with asbestosis from the schedule of compensable cancers, neither did the data then available clearly support, on a statistical basis, an unquestioned association between the two conditions. The data presented summarize the observations made among workers in the Dresden asbestos industry from 1952 to mid-September, 1964, with particualar reference to the question of the association between asbestosis and lung cancer. These data now take precedence over previous published data from the Dresden area, being based upon significantly longer periods of observation.##

06710 85

J. Jagatic, M. E. Rubnitz, M. C. Godwin, and R. W. Weiskopf

TISSUE RESPONSE TO INTRAPERITONEAL ASBESTOS WITH PRELIMINARY REPORT OF ACUTE TOXICITY OF ASBESTOS IN MICE. Preprint (1967).

The use of asbestos fibers exposed to a high temperature and injected into the experimental animals produced a high degree of toxicity, resulting in sixty per cent mortality. This experiment gives further support to the general concensus that asbestos produces fibrosis. Tissue in contact with asbestos needles not only produced fibrosis, but a special and peculiar type which is proliferative, granulomatous and invasive. It cannot be doubted that tissue behaves differently around asbestos fibers than it does around foreign body granulomas. It is not the intention of this article to theorize as to how or why asbestos powders produce fibroblastic proliferation or malignancies; these questions are under investigation, utilizing tissue culture techniques. The acute toxicity of heated asbestos observed was very unusual. There are still twenty mice under observation seven months after injection with the heated asbestos. After surviving the acute toxicity, these mice have recovered and are in good health.##

01507 86

W. T. Keane and M. R. Zavon

OCCUPATIONAL HAZARDS OF PIPE INSULATORS. Arch. Environ. Health, Vol. 13:171-184, Aug. 1966.

An analysis of the job indicated that the handling of fibrous glass, magnesium carbonate, and calcium silicate material containing asbestos fibers, adhesives, and cements occupies 80-90% of the av. insulators working time. This survey was made to investigate all of the substances with which insulators come in contact in their trade, and the majority of the substances examined proved incapable of presenting a serious health hazard to insulators. The only insulating substance which justifies concern is asbestos. This report and other available scientific data at the present time are insufficient to provide an adequately based conclusion.##

07955 87

Kendall, Brian and Maxwell Caplin

PLEURAL CALCIFICATION. Brit. J. Diseases Chest (London), Vol. 61, p. 126-130, 1967. 12 refs.

The causes of pleural calcification are described and some differential diagnostic features are discussed. A total of 319 patients in three groups were studied. In patients with a history of exposure to asbestos, pleural thickening was never marked and the calcification appeared intimately applied to the thoracic cage or mediastinum. Pleural calcification resulting from exposure to asbestos is usually bilateral and affects the parietal plaura. It produces multiple jagged plaques which slowly coalesce. Basal pleural thickening is usually slight or absent, pulmonary fribrosis is not frequent and there is generally no contraction of the thorax. It has been suggested that the calcification is due to direct mechanical irritation of the parietal pleura by the movement during respiration of the sharp asbestos fibres. Bilateral pleural calcification involving the diaphragm may be diagnostic of asbestosis, although two patients studied had such calcification after bilateral pneumothorax treatment and neither had been exposed to asbestos. In four patients no etiological factor could be discovered and these exemplified endemic asbestosis. The relationship of mesothelioma and carcinoma of the lung to asbestosis is reviewed.##

07939 88

M. C. S. Kennedy, R. Routledge

INVESTIGATION OF A MINOR ASBESTOS HAZARD. Brit. J. Ind. Med. (London), Vol. 24, p. 232-239, July 1967. 13 refs.

An investigation was made of 12 men who had been exposed to small amounts of asbestos to see fi there were any radiological, physiological, or clinical changes. Ten men had worked from 15 to 37 years in a transformer department lagging transformer windings with asbestos paste. Two of these men showed minor radiological and physiological changes suggestive of early asbestosis. Two men who had been milling and sawing asbestos sheets for 5 and 23 years showed minor radiological and abnormal physiological changes. Samples taken with the thermal precipitator in the transformer department showed less than 1 fiber per ml of air which is below any currently accepted maximum concentration. Samples taken in the insulation department with the hexhelet sampler showed 47 and 57 microgram/cu m compared to tentative maximum allowable concentration of 100 microgram/cu m. In the transformer department, mica paper has been substituted for asbestos. In the insulation department, the ventilation has been redesigned and improved The significance of these findings is not clear and further follow-up studies are planned. More evidence is required regarding possible pulmonary changes in men exposed to low concentrations of asbestos.##

03308 89

R. Kiviluoto

PLEURAL PLAQUES AND ASBESTOS: FURTHER OBSERVATIONS ON ENDEMIC AND OTHER NONOCCUPATIONAL ASBESTOSIS. Ann. N.Y. Acad. Sci. 132, 235-9, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 1964.)

In advanced cases of pleural plaques, rotentgen diagnosis is easy. Misinterpretations as lung or pleural tumors are possible, especially if relationship to asbestos or dusts is not known. In the literature, benign local parietal pleural changes "of obscure origin" consisting of hyaline sclerotic fibrin, at first misinterpreted as lung or pleural tumors, have also been reported. To judge from the description of those pleural changes, they seem very similar to those seen in asbestosis. The correct roentgenological observation and interpretation of parietal pleural plaques enable sdiscovery of pneumoconiosis even in cases which show no other clinical evidence of an inhalation damage. Even though not pathognomonic to asbestosis, pleural plaques are of significance for industrial hygiene and may be very helful in epidemiologic studies. The detection of exposure to asbestos or mixed dusts is often very difficult in case histories, mainly because the interval between exposure and manifestation may range from several years to decades. Also, it should be noted that asbestos is found with great difficulty in paraffin sections of ordinary thickness. In cases of pleural plaques asbestos may be found more often if they are specially searched for and if special methods are used. (Author summary)##

02256 90

M. Kleinfeld

PLEURAL CALCIFICATION AS A SIGN OF SILICATOSIS. An. J. Med. Sci. 125/215-134/224, Feb. 1966.

A clinical and environmental evaluation was made of 8 workers exposed to silicates, namely, talc, asbestos or mica. The minimum duration of exposure was 23 years and the longest 54 years. Two individuals who were exposed to asbestos also had an exposure to fiberglass; the remaining 6 had no other occupational dust exposure. Respiratory symptoms were present in 6. In 5 of these, dyspnea was the predominant complaint. Three of the 6 had a chronic cough. Abnormal lung findings including rales and wheezing were found in all with respiratory symptoms. Four of the 6 showed clubbing. In 5 individuals, the pleural calcification was confined to the diaphragmatic region; in 3 the calcifications were more widespread and in one of these they were located over the left lung field, along the left cardiac border and over the left diaphragm. The chest roentgenograms of 5 also showed varying degrees of pulmonary fibrosis. Chest roentgenograms, taken 14 years prior in one instance, and 25 years in the remaining 3, showed pulmonary fibrosis in 4 and pleural calcification in 2. Five of the 8 individuals were given pulmonary function tests. The findings were normal in 1 and abnormal in 4. Normal findings occurred in the individual who was asymptomatic. Of the 4 showing abnormal lung function parameters, 2 had an impairment in both ventilatory and diffusion capacity and 2 demonstrated ventilatory dysfunction indicative of restrictive breathing disorder. (Author summary)**

02272 91

M. Kleinfeld, J. Messite, O. Kooyman, and J. Sarfaty

EFFECT OF ASBESTOS DUST INHALATION ON LUNG FUNCTION Arch. Environ. Health 12, 741-6, June 1966.

Pulmonary function tests were performed on 56 workers engaged in asbestos insulation. The mean duration of exposure was 24.3 years with a range of 14 to 57 years. The predominant symptoms were dyspnea (9) and cough (18). Basilar crepitations and clubbing were noted in 11 and 8, respectively. The mean predicted values for the various pulmonary function parameters measured were within the 95% confidence limits of the control group. However, an appreciable number of asbestos workers had values which fell outside these limits. This was particularly evident in the vital capacity and DLco. There were 16 who showed pulmonary infiltration on their chest roentgenograms as compared to 40 without such evidence. Those with positive radiologic findings had a proportionately greater number of abnormal pulmonary function values as compared to those without. In general the correlation between the degree of pulmonary function impairment and the clinical and radiological findings was poor for the exposed group as a whole and no consistent correlation could be found between the duration of exposure and lung function impairment in this group. (Author summary)**

08637 92

Kleinfeld, M. J. Messite, and O. Kooyman

MORTALITY EXPERIENCE IN A GROUP OF ASBESTOS WORKERS. Arch. Environ. Health, 15(2):177-180, Aug. 1967. 6 refs.

Mortality data on 46 asbestos insulators in New York state,who had 15 or more yeears of exposure to asbestos dust by 1945, or had achieved 15 years of exposure between 1945 and 1965, were reviewed. The average age of death was 60.3 years with a range of 33 to 81 years. There were 12 deaths due to malignancies of lung or pleura. The differences in the mean age and mean duration of exposure for the 46 deaths and the group that developed cancers of lung or pleura were not statistically significant. Proportional mortality from carcinoma of the lung and pleura among asbestos workers studied was nine times that expected in U.S. white males. The observed mortality was significantly higher in the 40- to 59- as well as in the 60- to 79-year age groups. The mean duration of exposure of the asbestos workers with lung or pleural cancers was five years longer in duration than that found in the talc group with similar malignancies. In addition, other components in the asbestos dust exposure such as the presence of metallic cations may also be a factor to account for the difference in incidence between the two groups. Carcinoma of the gastrointestinal tract and peritoneum, of which there were seven cases, showed a significantly greater incidence in the observed as compared to the expected in U.S. white males. Death due to cor pulmonale was observed in only two individuals. The low incidence of cor pulmonale was a cause of death as compared to the high incidence of pulmonary and gastrointestinal carcinoma may be ascribed to a lower level of asbestos dust exposure occurring over a longer period of time. AS

07055 93

M. Kleinfeld, J. Messite, O. Kooyman, and M. H. Zaki

MORTALITY AMONG TALC MINERS AND MILLERS IN NEW YORK STATE
Arch. Environ. Health 14 (5), 663-7 (May 1967).

Mortality data on 91 talc miners and millers in New York state who had 15 or more years of exposure to talc dust by 1940 or had achieved 15 years between 1940 and 1965 were reviewed. The average age at death was 60.4 years with a range of 38 to 84 years. Proportional mortality from carcinoma of the lung and pleura among talc workers was four times that of the control population. However, the significant increase in incidence appeared in the 60 to 79 year age group rather than in the 40 to 59 year group. This was at variance with findings in asbestos workers who had a similar duration of exposure covering a similar period where the increase in observed incidence was present in both age categories. The earlier occurrence in the asbestos workers was attributed to the greater carcinogenicity and possibly to exposure to asbestos dust of greater concentration as compared to commercial talc. Carcinoma of the gastrointestinal tract and peritoneum showed no significant difference in the talc and control populations. However, in the asbestos workers gastrointestinal and peritoneal malignancies were elevated significantly. Death due to pneumoconiosis or its complications, or both, was recorded in 28 individuals, 19 of whom died from cor pulmonale. The cause of death in the remaining nine was tuberculosis (5) or bronchopneumonia (4). The lapsed time from first talc exposure to death from pheumoconiosis or complications, or both, averaged 25.9 years, with a range from 15 to 39 years. Excluding cor pulmonale, there were 25 cardiac deaths, 19 of which were due to coronary artery disease, three to hypertensive heart disease, and three to rheumatic heart disease. Of the 91 death cases, data on environmental exposure were available in 80. The mean duration of exposure for this group was 24.7 years with a range of 15 to 47 years.##

03323 94

J. F. KNOX, R. S. DOLL, I. D. HILL

COHORT ANALYSIS OF CHANGES IN INCIDENCE OF BRONCHIAL CARCINOMA IN A TEXTILE ASBESTOS FACTORY. Ann. N.Y. Acad. Sci. 132, 526-35, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

It is clear that there has been a considerable improvement in the mortality experience of the workers employed. Standards of living throughout the period have greatly improved but not more so than in other areas of Great Britain. The main obvious factor in this improved situation is the great improvement of working conditions with the implementation of the regulations for the industry enacted in 1931. In the factory studied, exposure to asbestos dust before 1933 carried with it a greatly increased risk of lung cancer and substantially increased risk of dying from other respiratory and cardiovascular diseases. It is possible that the specific occupational hazards to life have been completely eliminated, but it is not possible to assert this with confidence and further detailed observations are needed.##

04676 95

F. M. Kogan

ASBESTOS DUST AND LUNG CANCER. (Asbestovaya pyl' i rak legkikh.) Gigiena i Sanit. 29, (7) 96-102, July 1964. Russ. (Tr.)
CFSTI: 65 50023/7

The majority of authors have revealed a higher percentage of lung cancer in the bodies of persons who had asbestosis than in those of persons who had no association with asbestos or who had had silicosis. The majority of these patients were 55 to 60 years old; they had worked 20 years or more in the asbestos industry. In persons working with asbestos a high incidence of serous pleural tumors as well as neoplasms with an extrapulmonary localization are noted. At the asbestos mines in Canada, the mortality rate of the workers from lung cancer is higher than the lung cancer mortality rate for the general public.
A marked tendency toward the formation of neoplasms was noted in animals which were covered with asbestos dust; in these cases it was noted that not only the long asbestos fibers can exert such an effect. In the Soviet literature to date this problem has not been studied.##

03919 96

F. M. Kogan and A. P. Dorinovskaya

EFFECT OF ASBESTOS AND SERPENTINE DUSTS ON PULMONARY TISSUE CULTURE. Hyg. Sanig. 31, (4-6) 37-41, Apr.-June 1966.
Russ. (Tr.)
CFSTI, TT 66-51160/4-6

Both serpentine and asbestos dust inhibited the growth and migration of cells in a culture of pulmonary tissue from a human embryo. The effect was more pronounced in the case of asbestos dust. The addition of asbestos dust and, to a lesser extent, serpentine dust, caused some inhibition of the early phases of mitosis. Serpentine dust cannot be regarded as biologically inert, but its effects were less pronounced than those of asbestos dust. On the whole, the findings as to the biological effects of asbestos and serpentine agree with the results of histological studies of the lungs in animals, as well as with the in vivo content of hydroxyproline in the lungs. Any assessment of the possible hazards of asbestos-containing dust should also take into account the presence of serpentine.##

06871 97

F. M. Kogan, A. A. Gerasimenko, G. I. Bunimovich

THE OCCURRENCE OF CERTAIN IMMUNOBIOLOGICAL CHANGES IN ASBESTOSIS. (Nekotorye immunobiologicheskie sdvigi pri asbestoze.) Hyg. Sanit. (Gigiena i Sanit.) 30 (5), 184-91 (May 1965). Russ. (Tr.)

Immunobiological reactivity was studied in asbestosis patients and healthy persons who had worked with asbestos over a fairly long period of time to find out whether changes in reactivity, were due to a developing condition of asbestosis or whether it preceded asbestosis. Long-term inhalation of asbestos dust brought about a fall of the immunobiological reactivity of the body and probably, its allergization. There was a most distinct inhibition of the complement titer. The changes of the complement titer preceded the onset of clinical and X-ray symptoms of pneumoconiosis. The study of the immunobiological reactivity of persons sick with asbestosis, caused by the inhalation of chrysotile asbestos, showed that in the first case the reactivity was inhibited to a greater extent. This was noted in the clinical course of asbestosis as well. Persons sick with asbestosis and those working under conditions of high dust content of the air presented lesions peculiar to autoimmunologic disease: rise in the gamma-globulin and anticomplementary activity of the serum.##

04244 98

F. M. Kogan, S. Yu. Troitskii, and M. R. Gulevskaya

CARCINOGENIC EFFECT OF ASBESTOS DUST. (K voprosu o kantserogennom vliyanii asbestovoi pyli.) Hyg. Sanit. 31, (8) 218-25, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

The mortality rate of lung cancer was studied for 10 years (1953-1962) among workers dealing with asbestos and the rest of the population in the town as well as in all of the Sverdlovsk region. The mortality from lung cancer in the town was twice as high as that in the Sverdlovsk region. The finding was that the mortality from lung cancer among workers of the asbestos concentration plants was three times higher than among the rest of the population in the town. The standardized sex mortability rate among workers over 40 years old was 3.6 times higher than that among the rest of the population. The mortality rate among women workers dealing with asbestos was several times higher than that of the rest of the population. Lung cancer proved to be the cause of lethality in 9 per cent of deaths among persons sick with asbestosis. The paper deals with a number of possible causes of augmented mortality from lung cancer among persons who have inhaled asbestos dust for a long time. (Author summary modified)**

02486 99

J. Lieben.

MALIGNANCIES IN ASBESTOS WORKERS. Arch. Environ. Health 13, (5) 619-21, Nov. 1966.

A study of 68 hospital admissions with asbestosis from an asbestos textile and friction materials plant inlcuded 21 malignancies, 13 of these were carcinoma of the lung and 8 carcinomas of other organs. Eighteen of the patients had exposure to asbestos in their occupational environment for 10-36 yrs. Only 3 patients had their 1st exposure after 1940. A repeat study in the future may clarify whether this reduction of cancer occurrence in more employees is due to latent period, to the age factor, or to the dust control measures instituted by the plant.**

13625 100

Lindberg, Walter

AIR POLLUTION IN NORWAY. II. PUBLIC HEALTH ASPECTS OF AIR POLLUTION - A LITERATURE STUDY. (Den Alminnelige Luftforurensning i Norge. Luftforurensning som Helseproblem, - en Litteraturstudie.) Translated from Norwegian. Oslo Univ. (Norway), p. 66-77, 1968.

This presentation discusses functional and anatomical changes arising from diseases caused by air pollution. The discussion includes air pollution episodes, pollutants known to cause specific effects (arsenic compounds, mercury, beryllium compounds, manganese compounds, and lead). Lead and carbon monoxide are discussed in greater detail. Emphasis is also placed on respiratory irritations caused by SO2, nonspecific upper respiratory diseases, the effect of air pollution on the occurrence of colds, smoking, chronic bronchitis emphysema, bronchial asthma, lung cancer, and heart disease.

08417 101

Lucas, Galvao

THE VALUE OF RESPIRATORY FUNCTION TESTS IN PNEUMOCONIOSIS. TECHNICAL AND PHYSIOPATHOLOGICAL ASPECTS.
((O valor das provas funcionais respiratorias nas pneumoconioses. Aspectos tecnicos e fisicpatologicos.)) Text in Portoguese. J. Med. (Porto), 62(1259):589-609, 612, March 11, 1967.

Spirograms of the chest movements during respiration, chest X-rays, graphs, and extensive tabular data support this discussion of the technical aspects of pneumoconiosis (silicosis, asbestosis, benign pneumoconiosis, anthracosis, siderosis, calcicosis, baritosis, and berylliosis). The frequent discrepancy between radiological changes and functional alterations is mentioned. Mathematical relations and equations, methodology, equipment, and instrumentation used in measurement and analysis are described. The triple gradient method used to analyze the alveolar-arterial oxygen gradient is explained. A comprehensive classification of pneumoconiosis caused by mineral dusts and organic agents is presented and the types of respiratory changes are noted. Case material is included, with a professional interpretation of the diagnosis and prognosis of these cases, which are often accompanied by bronchitis, emphysema, and symptoms of aging.

05739 102

McFee, D. R. and R. Tye

ADSORPTION OF PROTEINS ON DUSTS RELATED TO THE PNEUMOCONIOSES: SELECTIVITY. J. Occupational Med. (Ottawa) 7, (6) 269-75, June 1965.

To investigate selective adsorption of proteins from human serum, dusts of quartz, cristobalite, silica gel, asbestos, emergy, and ferric oxide were equilibrated with human serum. The unadsorbed and adsorbed portions were then examined by both paper electrophoresis and immunoelectrophoresis. Although a number of differences in selectivity were noted, only one common difference was outstanding. Most of the dusts, including all of the active dust, appeared to have adsorbed the fast lipoprotein selectively. The emergy and the ferric oxide did not. Both are classed among the so-called inert dust. There were no other characteristics common to the active dusts which were not shared by the so-called inert dusts. If active dust had shown no selectivity or patterns of selectivity like those of inactive dusts, the possibility that selectivity is a determining factor in the biological activity of dusts would be seriously diminished. Since the finding was the reverse, that possibility must be regarded as strengthened.)Author summary modified)

08875 103

Macnab, G., and Harington, J. S.

HEMOLYTIC ACTIVITY OF ASBESTOS AND OTHER MINERAL DUSTS. Nature, Vol. 214, p. 522-533, April 29, 1967. 10 refs.

The fact that chrysotile asbestos is as potent a hemolytic agent as silica powder is demonstrated. Other forms of asbestos lysed erythrocytes only after prolonged incubation with them, and a wide range of mineral dusts was inactive. The hemolytic action of chrysotile was completely prevented by disodium versenate and simple phosphates but only partially by polyvinylpyridine-N-oxide and aluminium, both of which protect cells against lysis by silica. The following finely ground materials were used: crystalline and amorphous silica, silicic acid powder, silica gel, chrysotile, amosite, anthophyllite and crocidolite asbestos, serpentine, aluminium oxide, Sephadex G-25', high and low rank coal dust, mine dust,colloidal carbon, talc, kaolin, glass powder, carborundum and diamond dust. Significant hemolytic activity was found for chrysotile, serpentine and all forms of silica tested. The rate of hemolysis by chrysotile was greater than that shown by silica, the apparent lower percentage hemolysis by the asbestos being the result of the adsorption of released hemoglobin during the early stages of lysis. Hemolysis by chrysotile took place rapidly, with the immediate adsorption of hemoglobin on the asbestos fibres. Because of this, the degree of hemolysis in the supernatant (as measured colorimetrically) never reached 100 per cent. This was also found in the case of the adsorbents, silicic acid and silica gel. It also seems clear that the highly active lytic property of chrysotile is related to the adsorptive capacity of this form of asbestos. It was demonstrated that under the same conditions, chrysotile adsorbs five times more protein from serum than silica. More protein is required to "cover" the hemolytic sites of chrysotile than of silica. Chrysotile also has the highest Mg/Si ratio of the three forms of asbestos tested and differs also in that iron is not formally included in the lattice. It has a very high zero point of charge (pH 10-12), that is, over most of the pH range it will carry a net positive charge.##

104

13563

MacPherson, Peter and John K. Davidson

CORRELATION BETWEEN LUNG ASBESTOS COUNT AT NECROPSY AND RADIOLOGICAL APPEARANCES. Brit. Med. J. (London), 1:355-357. Feb. 1969. 14 refs.

An attempt was made to correlate the asbestos count on histological section with the pulmonary radiographic findings, in order to discover if there is a level at which evidence of asbestosis becomes discernible on a chest radiograph. The survey is concerned with the radiological appearances of the first 100 of a series of 600 necropsies in which a chest radiograph had been found to be positive in 44 and negative in 56 of the cases. Radiological evidence suggestive of asbestosis was found in 8 of the 44 cases with positive counts and in only one of the group with negative counts. As expected, the higher the asbestos count, the greater the likelihood of positive radiographic features. Such changes were present in eight of the nine cases in which the count exceeded 40. The most common radiographic findings were the noncalcified pleural plaque on the lateral chest wall and calcified diaphragmatic pleural plaques.

03303 105

J. C. McVittie

ASBESTOSIS IN GREAT BRITAIN. Ann. N.Y. Acad. Sci. 132, 128-38, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1965.)

Author discusses the occupations which are likely to encounter problems of asbestosis. In Great Britain, the Industrial Injuries Act was amended to include pneumoconiosis which was defined in the Act as "fibrosis of the lungs due to silica dust or other dust..." Tables are presented delineating principal occupation and the grand total of those affected in specific occupations from 1948 to 1963.##

07168 106

W. T. Marr

ASBESTOS EXPOSURE DURING NAVAL VESSEL OVERHAUL. Am. Ind. Hyg. Assoc. J. Vol. 25:264-268, June 1964.

The Long Beach Naval Shipyard has several men on disability compensation and one death due to asbestosis. Many of these employees have more than 20 years' experience as pipecoverers and insulators working primarily aboard ship. Asbestos exposure during ship overhaul and repair varies extensively giving an entirely different problem from exposure in mining and manufacturing operations. The maximum allowable concentration for pipe covering operations or for short duration massive exposures is unknown. There still remains a difference of opinion among medical authorities on a MAC and the effects of short-fiber asbestos. Chest x-ray examinations of employees exposed to asbestos can be misleading as it usually takes a minimum of seven years for cases of asbestosis to develop. Shipboard pipecovering and insulating during overhaul and repair is a hazardous trade. Employees in this trade should wear respirators when exposed to dry insulation material containing asbestos. (Author summary)##

05737 107

Mastromatteo, E.

RECENT OCCUPATIONAL HEALTH EXPERIENCES IN ONTARIO. J. Occupational Med. (Ottawa). (Presented at the American Industrial Health Conference, Bal Harbour, Fla., Apr. 1965.). 7(10):502-511, Oct. 1965.

Industrial exposure to several toxic agents is reveiwed and case histories are given. Included are mercury exposure in chlor-alkali plants, electrical outdoor advertising, the hat industry, and the treating of grain seed with an organic mercurial fungicide; asbestos insulation and the manufacture of brake linings and clutch faces; exposure to toluene didiisocyanate and a curing agent for isocyanate-containing polymers; furfuryl alcohol exposure; illness associated with urethane foam manufacture; and respiratory sensitization in a rubber industry.

07730 108

Mikov, M. I.

ASBESTOSIS IN EMPLOYEES OF THE 'KORLACE' ASBESTOS MINING AND SEPARATING WORKS. ((Azbestoza kod radnika zaposlenih u rudniku i separaciji azbesta "korlace" - brvenik na ibru.)) Text in Serbo-Croatian. Arhiv Hig. Rada Toksikol. (Yugoslavia), Vol. 17, p. 63-70, 1966. 23 refs.

The entire work force was examined: 64 employed in the separation of the asbestos, 10 in the warehouse, and 23 miners. Of these 97 workers asbestosis was diagnosed in 29 (29.9%) and an unconfirmed suspicion of the condition was found in an additional 10. The 29 cases diagnosed were classified as 26 in the initial stages and 3 as more advanced. The largest number of cases was found in those employed in storage: 40% of those examined. Only 13% of the miners and 34.4% of those employed in separation were found to have the condition. A very high correlation was found between clinical signs and symptoms and x-ray findings.##

01440 109

L. Miller, W. E. Smith, and S. W. Berliner

TESTS FOR EFFECT OF ASBSETOS ON BENZO(A) PYRENE CARCINOGENESIS IN THE RESPIRATORY TRACT . Ann. N.Y. Acad. Sci., Vol. 132:489-500, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Time of appearance and yields of papillomas and carcinomas in the respiratory tract of hamsters after intratracheal injections of benzo(a)pyrene are reported. Addition of the chrysotile variety of asbestos to the injections gave results consistent with an hypothesis that this material promoted benzo(a)pyrene carcinogenesis in the respiratory tract. Addition of the amosite variety of asbestos to injections of benzo(a)pyrene did not increase the yield of tumors found in the respiratory tract. The yield of tumors in the respiratory tract of hamsters treated with a limited series of intratracheal injections of benzo(a)pyrene decreased with time after discontinuation of exposure. This observation is of interest in relation to lung cancer risks in smokers who discontinue smoking. Further studies of histological material from these experiments are in progress.##

07018 110

T. G. Morris, W. H. Roberts, R. E. Silverton, J. W. Skidmore, J. C. Wagener, and G. W. Cook

COMPARISON OF DUST RETENTION IN SPECIFIC PATHOGEN FREE AND STANDARD RATS. Proc. Intern. Symp. Inhaled Particles Vapours, II, Cambridge, England, 1965. pp. 205-212, 1967.

A comparison was made of dusts and silica retention in specific pathogen free (S.P.F.) and standard rats. In the examination of the histological sections from the standard rats it was noted that the least dust was present where the disease was most pronounced but the weights of dust found by the chemical analysis were not more variable in the standard rats than in the S.P.F. rats. The disparity may be explained by the fact that in the development of rat bronchitis there is a tremendous increase in reticulo-endothelial tissue. Although the dust in the diseased animals was no longer visible in the air spaces or the peribronchial tissue it had probably been taken up by the reticulo-endothelial phagocytes. The lung tissue response to the dusts was found to be similar for both types of rat, the silica producing a typical granulomatous silica reaction. It did not appear to exacerbate the infection in the standard rats more than the other dusts. The tissue reaction to the amosite was more marked than to the chrysotile and was progressive, in contrast the reaction to chrysotile regressed with the elimination of the dust.##

01472 111

G. Nagelschmidt

SOME OBSERVATIONS OF THE DUST CONTENT AND COMPOSITION IN LUNGS WITH ASBESTOSIS, MADE DURING WORK ON COAL MINERS PNEUMOCONIOSIS. Ann. N.Y. Acad. Sci. 132, 64-76, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Author presents statistics delineating the possible correlation between asbestosis, pneumoconiosis, and fibrosis. A world wide survey has been conducted and the correlations observed are presented in tables, the titles of which are the following: (1) Lung Dust Analysis in Asbestosis; (2) Average Quantity of Mineral Residue in Asbestosis Lungs from Great Britain; (3) Average amounts of Silicon Dioxide and Ferric Oxide in asbestosis Lungs from Great Britain; (4) Comparison of Iron and Dust Content, of Asbestosis Workers' lungs with Similar Data for Coal Miners with Simple Pneumoconiosis; (5) Asbestosis Lungs from South America: Number of Lungs with Different Grades of Fibrosis and Types of Asbestos, and Acetic Acid Residue Content; (6) Lung Residues of Asbestosis from South Africa: Numbers of Residues with Different Fiber Frequencies after exposure to Amosite and Crocidolite.##

07171 112

G. Nagelschmidt

THE STUDY OF LUNG DUST IN PNEUMOCONIOSIS. Am. Ind. Hyg. Assoc. J. Vol. 26:1-7 Feb. 1965. (Presented at the Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa., Apr. 1964.)

In Western Europe pneumoconiosis is the most important of all industrial diseases, in the sense that it affects the largest numbers of men. In particular, this applies in Britain, Western Germany, France, Belgium and Holland to pneumoconiosis of coal miners. The Safety in Mines Research Establishment has been working since 1949 on techniques of analyses for dust in lungs as related to pneumoconiosis among coal miners. There appears to be a difference, as yet speculative, in the fibrinogenic properties of dust as related to their solubility. For a given severity of fibrosis, less of an insoluble dust is required the higher the quartz content. Pneumoconiosis of coal miners seems to vary with rank (quality) of coal or rock content of the airborne dust. (Author's summary, modified)##

07594 113

Nakamura, I.

CLINICAL AND PATHOLOGICAL STUDIES OF PULMONARY ASBESTOSIS. J. Nara Med. Assoc., 18(4):455-465, Aug. 1967. 20 refs.

The environmental conditions in asbestos factories in Osaka and Nara were investigated. The nature of the dust in the factories was studied by electron microscopy. The concentration of suspended particles is tabulated for different plant operations in a Nara factory. The occurrence of asbestosis among the employees of these factories was studied by periodic X-ray examinations. Although definite asbestosis could not be found in employees working less than 5 years, the frequency of detection of definite asbestosis increased in those working more than 5 years as follows: there was 21 percent in those employed between 5 to 10 years, 54 percent between 10 and 15 years, 70 percent between 15 and 20 years, and 100 percent for those employed for over 20 years. The classification of X-ray findings and the development of asbestosis are discussed. Case histories and photographs of X-rays and lung sections are presented.##

03328 114

M. L. Newhouse and H. Thompson.

EPIDEMIOLOGY OF MESOTHELIAL TUMORS IN THE LONDON AREA. Ann. N.Y. Acad. Sci. 132, 579-88, Dec. 31, 1965 (Presented to the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Two groups of patients who have attended a large hospital in the East End of London have been examined to determine their exposure to asbestos. The first consisted of 83 patients in whom the diagnosis of mesothelioma had been confirmed at autopsy or by biopsy. Fifth-five per cent of the males and 42 per cent of the females died under the age of 55. The interval between first exposure and development of terminal illness ranged between 16 and 55 years (mean 37 years). The second groups consisted of 76 patients of the same hospital, matched by sex and date of birth with those traced in the first series. Of the patients suffering from mesotheliomata 52.6 per cent had been exposed to asbestos, as compared to 11.8 per cent of the control series. Three main types of exposure were recognized: work in factories manufacturing asbestos textiles, insulating materials, and other products; employment as laggers or insulators; and exposure to dust brought home by relatives working with asbestos. Among the 36 patients with mesotheliomata, with no positive occupational history and no relatives living at home who worked with asbestos, there were 11 who lived within half a mile of an asbestos factory; five of the control series also lived in the same area. The difference in the proportion of patients in the two series is also statistically significant. (Author summary modified)**

00814 115

M.L. Newhouse H. Thompson

MESOTHELIOMA OF PLEURA AND PERITONEUM FOLLOWING EXPOSURE TO ASBESTOS IN THE LONDON AREA. Brit. J. Ind. Med. (London) 22, (4) 261-9, Oct. 1965.

A series of 83 patients from the London Hospital with a diagnosis of mesothelioma confirmed by necropsy or biopsy has been studied for possible exposure to asbestos. The series consisted of 41 men and 42 women; 27 of the patients had peritoneal and 56 pleural tumors. The earliest death recorded was in 1917, but only 10 of the series died before 1950 and 40 (48%) between 1960 and 1964. In 76 of the series full occupational and residential histories were obtained. Forty (52.6%) gave a history of occupational or domestic (living in the same house as an asbestos worker) exposure to asbestos compared with nine (11.8%) out of 76 patients from the same hospital suffering from other diseases. None of the 17 suspected cases of mesothelioma, rejected on pathological grounds, was found to have had any exposure to asbestos. There was also evidence that neighborhood exposures may be important. Among those with no evidence of occupational or domestic exposures, 30.6% of the mesothelioma patients and 7.6% of the inpatients with other diseases lived within half a mile of an asbestos factory. Out of the 31 patients with occupational exposures only 10 were in jobs scheduled under the Asbestos Regulations of 1931. The interval between first exposure and the development of the terminal illness of mesothelioma ranged between 16 and 55 years. In 48 patients in the mesothelioma series, lung tissue or sputum was available for examination. In 30 (62.5%) either asbestosis or asbestos bodies were present. (Author summary)##

06245 116

Nutt, A. and J. S. Harington

THE REACTION OF REDUCED GLUTATHIONE WITH QUARTZ POWDER AND WITH ASSOCIATED IRON AND COPPER. (Med. Lavoro (Milan)) 55 (3), 176-83 (Mar. 1964).

The observations that quartz powder possesses oxidative and hydroxylative properties suggested that reduced glutathione might also be affected by quartz. In the present work, it was found that quartz powder not freed of its surface metals (mainly iron, copper and aluminium) oxidized reduced glutathione in in vitro conditions, but quartz powder freed of its surface metals, did not. The process may be ascribed to the iron present on the quartz surface, and at this concentration both ferric and ferrous ion alone are capable of oxidizing glutathione to the same extent as unwashed quartz does. Copper at the concentration at which it is found on quartz, did not affect glutathione in any way, although at higher concentrations it was active. Previous workers have shown that iron does not catalyse the oxidation of glutathione; the present study shown that it is capable of doing this efficiently, but at far higher amounts than those used in earlier studies. In vitro and in vivo studies show that asbestos dusts are as effective, or better, than quartz in oxidizing glutathione. (Author summary modified)

03333 117

W. G. Owen

MESOTHELIAL TUMORS AND EXPOSURE TO ASBESTOS DUST. Ann. N.Y. Acad. Sci. 132, 674-9, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

In the present investigation evidence of asbestos exposure was sought in recorded examples of diffuse mesothelioma occurring in Liverpool and in neighbouring towns of the Merseyside area of North West England. This is an industrial area with a population of over two million people. Ship building and ship repairing are prominent among the industries which use asbestos, and there are a number of factories in the area where processing of raw asbestos is carried out. A close association between exposure to asbestos dust and the development of diffuse mesothelioma is confirmed, and it is concluded that asbestos exposure is a major factor in the causation of this tumor.##

01762 118

W. W. Payne

OCCUPATIONAL FACTORS IN CARCINOGENESIS. Public Health Rept. (U.S.) 81, (9) 777-81, Sept. 1966.

The author reviews the history of the occurrence of cancer in various occupational groups resulting from exposure to specific carcinogens. Examples are the occurrence of scrotal cancer in workers exposed to polycyclic aromatic hydrocarbons, bladder cancer in dye workers exposed to aromatic amines, and bronchogenic cancer in workers employed in the chromium industry. Other inorganic carcinogens are cited, among them arsenic, nickel, and asbestos dust. The importance of studying occupational exposures to possible carcinogens is emphasized.##

01409 119

Peacock, P. R. and A. Peacock

ASBESTOS-INDUCED TUMORS IN WHITE LEGHORN FOWLS. Ann. N.Y. Acad. Sci., Vol. 132:501-503, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Report gives the results of an experiment in which 0.5 ml asbestos suspension was injected into the right axillary air sac of six healthy birds, aged two to six. Amosite and crocidolite asbestos fibers were used. The results are inconclusive, however the tumors that did appear seem to have significance. This is conjectured by authors since no such tumors had been observed in some hundreds of control birds, mostly breeding stock, over a period of thirty-six years.##

10566 120

Pernis, B., E. C. Vigliani, M. A. Marchisio and S. Zanardi

OBSERVATIONS ON THE EFFECTS OF ASBESTOS ON CELLS IN VITRO. Med. Lavoro (Milan), 57(12):721-729, Dec. 1966. 15 refs.

The in vitro effects of two different types of asbestos dust upon guinea pig macrophages, mouse fibroblasts (strain L), and upon KB tumor cells are described. The macrophages phagocytose the dust very actively and cellular metabolism does not appear to be disrupted, as is the case when quartz dust is used. The fibroblasts also take up the asbestos dust very rapidly without any apparent damage; under the electron microscope, the particles or short fibers are collected in vacuoles or lysosome-like bodies. Cellular metabolism of collagen appears to be stimulated by the presence of asbestos. The attempt to induce the formation of asbestos bodies in KB cells by adding asbestos and FeSO4 was unsuccessful. The mechanism which leads to the formation of asbestosis is thus probably different from that leading to silicosis; a direct effect of asbestos on the fibroblasts should be considered.##

01420 121

B. Pernis, E. C. Vigliani, and I. J. Selikoff

RHEUMATOID FACTOR IN SERUM OF INDIVIDUALS EXPOSED TO ASBESTOS. Ann. N.Y. Acad. Sci. 132, 112-20, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The presence and titer of rheumatoid factors in the sera of 315 asbestos insulation workers and of 103 controls were determined by conditioned hemagglutination with tanned red cells coated with aggregated human or rabbit gamma globulins. The asbestos workers had been exposed to the dust for periods variable from 1 to 54 years, and most of them showed x-ray evidence of asbestosis that was graded in grades from 1 to 3. A definite increase in frequency and titers of Rheumatoid factors, with respect to the controls of same age and sex, was found in workers with asbestosis of grades 2 and 3. The factor found was mainly that which reacts with human and not with rabbit gamma globulins. Similar serological abnormalities are found in cases of pulmonary fibrosis of different origin (idiopathic silicosis, coal workers' pneumoconiosis, sarcoidosis, etc.) (Author summary)##

10259 122

Polliack, A. and M. I. Sacks

PREVALENCE OF ASBESTOS BODIES IN BASAL LUNG SMEARS. Israel J. Med. Sci. (Jerusalem), 4(2):223-226, March-April 1968. 12 refs.

Asbestos bodies were found in basal lung smears in 26 of 100 consective adult autopsies in Jerusalem. They were present in 29.29.1% of males and 22.2% of females, and were more frequently encountered in Ashkenazi than in non-Ashkenazi Jews. Asbestos bodies, when present, were usually scanty (less than 10), and in only two males were more than 30 bodies found under low power. The five subjects with more than ten asbestos bodies each were all Ashkenazi Jews. The prevalence of asbestos bodies is compared with Cape Town, Pittsburgh, Miami, Montreal, Glasgow, and Jerusalem. Highest frequency found is in Montreal (48%) and may reflect differences in the degree of atmospheric pollution.##

07831 123

Raunio, Veikko

OCCURRENCE OF UNUSUAL PLEURAL CALCIFICATION IN FINLAND. (STUDIES ON ATMOSPHERIC POLLUTION CAUSED BY ASBESTOS). Ann. Med. Internae Fenniae, Suppl. 47 (Helsinki), Vol. 55, 61p., 1966. ((73)) refs.

The peculiar, often bilateral pleural calcification which are common in east Finland especially in the communes of Tuusniemi and Kuusjarvi, where there are numerous asbestos deposits, were investigated. 600,000 x-rays were taken in the years 1960-1965 in the course of a compulsory mass x-ray program. In Tuusniemi, where asbestos has been quarried and milled at Paakkila for 50 years, the pleural calcifications were found in 9 percent of the pictures taken. In Kuusjarvi, where asbestos and talc have been quarried for 20 years on a smaller scale, the lesions were found in 6.4 percent of the pictures compared to 0.5 per thousand in other sections of east Finland. In eight communes bordering on the two with the high incidence, the occurrence was from 0.3 to 3.3 %. The asbestos in this area was primarily anthophyllite asbestos which, in studies of atmospheric pollution, was found to be scattered over the area for a distance of more than 25 km. from the asbestos mine. There is a certain amount of non-industrial exposure to asbestos dust in the area from its use in the homes in saunas and in a crushed form as a mortar. The x-ray appearance of the pleural calcification is peculiar and differs from calcifications from inflammation or hemothorax. Pulmonary fibrosis was seldom observed and extensive pleural calcifications did not cause any subjective symptoms. The frequency of lung cancer and of malignant pleural and peritoneal tumors was not higher in this area than in the rest of east Finland. No cases of pleural or peritoneal mesothelioma were detected at autopsies in the central hospitals serving the area.

10532 124

Roberts, G. Hefin

ASBESTOS BODIES IN LUNGS AT NECROPSY. J. Clin. Pathol., No. 20:570-573, July 1967. ((6)) refs.

A study was made in Glasgow, Scotland, near an industrial area where ship building is an important industry. Asbestos bodies were found in 23% of 100 concecutive hospital necropsies, bodies were present in 37% of the 62 males, none were found in 38 females. These findings are compared with results of other similar surveys. In 85.4% of cases showing asbestos bodies, hyaline pleural plaques were found. There was one case of asbestosis and three of bronchial carcinoma in the cases showing asbestos bodies. (Author's abstract, modified)##

13763 125

Royall, H. J.

THE HEALTH OF THE PUBLIC AND ASBESTOS USAGE. Royal Inst. Public Health Hyg. J. (London), 31(4-6):126-146, July-Dec. 1968. 49 refs.

The incidence of asbestos bodies in the lungs of various urban and rural populations throughout the world and the role of asbestos in the causation of tumors are discussed. Chrysotile, crocidolite, amosite, and anthophyllite are the main varieties of asbestos which are being produced at a rate of over 3,500,000 short tons per year. Asbestos bodies have been found in the lungs of populations throughout the world, ranging from 14 to 57% of the autopsied lungs of people of various occupations. Fifty-nine cases of non-occupational mesothelioma, probably due to domestic and environmental exposure to asbestos, are reviewed. The oils in asbestos, especially crocidolite, contain a polycyclic aromatic hydrocarbon, 3-4-benzopyrene, a well-known carcinogen, and crocidolite is considered to be very active in tumor causation. Tumors appear to form after a long latent period following exposure, thus making the asbestos exposure of young children especially hazardous.

06267 126

Sano, T.

PATHOLOGY AND PATHOGENESIS OF PNEUMOCONIOSIS. Acta Pathol. Japan. (Tokyo), 13(3):77-93, July 1963.

Various pneumoconioses have been investigated by autopsy in Japan. Included in the investigation were classical and nonclassical silicosis, asbestosis, talcosis, and pneumoconioses caused from diatomaceous earth, metallic aluminum lung, pyrite, pyrite cinders, graphite, and carbon lung. The tests suggested that, from a pathogenic point of view, pneumoconioses can be separated into two types: lymphatic and alveolar. Silica dust can provoke strong collagenous fibrosis in pulmonary lymph nodes, although intraalveolar changes contribute gradually to interstitial changes in the lung. Fibrosis is seldom observed in the lymphnodes of pneumoconiosis patients but it is the main cause of histological changes in the alveoli.##

03310 127

E. L. Schall

PRESENT THRESHOLD LIMIT VALUE IN THE U.S.A. FOR ASBESTOS DUST: A CRITIQUE. Ann. N.Y. Acad. Sci. 132, 316-21, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The present threshold limit value for asbestos dust in the U.S.A. is 5.0 millions of particles per cubic foot of air for a daily eight-hour exposure, 40 hours per week. This value was adopted many years ago by the American Conference of Governmental Industrial Hygienists and reaffirmed at the annual meeting in April, 1964. It refers to airborne concentrations of asbestos dust which represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect. However, threshold limits should be used as guides in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations. These limits are based on the best available information from industrial experience, from experimental human and animal studies, and when possible, from a combination of the three.##

15943 128

Selikoff, I. J.

ASBESTOS. Environment, 11(2):3-7, March 1969. 15 refs. (Presented at the Symp. on Unanticipated Environmental Hazards Resulting from Technological Intrustions, Am. Assoc. Advancement of Sci. Committee on Sci. in the Promotion of Human Welfare and the Scientists' Inst. for Public Inform., Dallas, Texas, Dec. 28, 1968.)

The magnitude of the hazard associated with direct occupational exposure to asbestos was confirmed by a 19-year study (1943 to 1963) of 632 insulation workers exposed to asbestos for 20 years or more. The expected number of deaths among the workers was 203. The actual number was 255. Forth-five deaths were due to cancer of the lungs or pleura; 29, to cancer of the stomach or colon; and 12, to asbestosis. Similar mortality statistics were obtained for 370 workers observed from 1963 to 1967. Where 47 deaths were expected, 49 occurred. Again, there was a significant excess of cancer. Studies in South Africa and Finland are also reported. They indicate that utilization of asbestos poses an indirect environmental hazard. Of 47 cases of mesothelioma in Cape Province, 45 lived in areas where asbestos was mined or worked in an environment where indirect, haphazard exposure was conceivable. In an asbestos mining county of Finland, 499 out of 6312 individuals X-rayed had pleural calcification. No calcification was found among 7100 individuals in the adjoining county. In Capetown, asbestos bodies were found in 26% of 500 successive autopsies of nonasbestos workers.

01441 129

I. J. Selikoff

THE OCCURRENCE OF PLEURAL CALCIFICATION AMONG ASBESTOS INSULATION WORKERS . Ann. N.Y. Acad. Sci., Vol. 132:351-367, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Data is presented which demonstrates that pleural calcification among workmen exposed to asbestos in this trade rarely occurs in less than 20 years from onset of exposure. Pleural calcification was found in 5 to 725 asbestos insulation workers with less than 20 years from onset of exposure but in 145 of 392 men examined more than 20 years from beginning work with asbestos. Similarly, the extent of calcification also increased with duration of exposure. Available data suggests that both total amount of exposure as well as lapsed time from onset of exposure are of importance. In this group of men, the earliest case seen was in a man examined 12 years from onset of exposure. Elsewhere, somewhat shorter periods from onset of exposure have been noted, but such cases are rare. Asbestos is by far the most common industrial dust involved and bilateral pleural calcification in the absence of evidence of traumatic or infectious pleural disease can usually be considered to be due to asbestos exposure. In half the cases, the calcification found was unilateral. The appearance and location of such calcification is described and no portion of the pleura was found to be immune. The diagnostic importance of such unilateral calcification is stressed since even unilateral calcification is uncommon in the general population and when it occurs, a traumatic or infectious history can generally be obtained. When the calcification is idiopathic, it should strongly suggest asbestosis and the presence of unilateral pleural calcification is almost as strongly diagnostic of asbestosis as is bilateral calcification. The pleural calcification is primarily found in the parietal pleura, more heavily in the lower portions of the chest. Data concerning correlations with pleural fibrosis and asbestotic parenchymal fibrosis is given. At the present time, it is likely that asbestos exposure is the most common cause of pleural calcification. The finding of such calcification as described here generally indicates asbestos exposure more than 20 years before. (Author summary modified)##

05860 130

I. J. Selikoff, R. A. Bader, M. E. Bader, J. Churg, and E. C. Hammond

ASBESTOSIS AND NEOPLASIA. Am. J. Med. 42 (4), 487-96 (Apr. 1967).

In at least one fourth of the adults who die in urban areas in the United States and other industralized countries asbestos bodies are found in the lungs. This observation has led to the recognition of asbestos-related disease as a potential serious modern urban hazard. Known data may be summarized as follows: (1) Asbestos inhaled under industrial conditions will produce a serious pneumoconiosis (pulmonary asbestosis) even with relatively light exposure. (2) Under similar conditions of heavy or light industrial exposure, workmen die of neoplasms more frequently than expected; (3) Widespread contamination of the environment may occur both from industrial sources (such as asbestos-containing dusts from construction sites) and from disintegration or use of asbestos products (such as asbestos-containing floor tiles and brake lining; (4) Such environmental contamination may result in widespread inhalation and retention of small numbers of the mineral fibers; and (5) Under certain conditions (for example, residence within a half-mile of an asbestos factory or in the house hold of an asbestos worker) environmental exposure has been shown to produce serious disease. The prediction that widespread asbestos contamination of city air will be associated with widespread neoplasia, however, is still an assumption, an extrapolation from the observed data since it is not known whether or not the small amounts inhaled as the result of asbestos air pollution have an effect comparable to the much larger amounts inhaled in industrial or intimate environmental circumstances. The question will not be resolved for some time because of the long latent period between initial contact and the appearance of clinical disease. Although there are variations based upon individual idiosyncrasy, intimacy, duration and continuity of exposure, and perhaps also upon such factors as the variety of asbestos used (chrysotile, amosite, crocidolite, anthophylite, tremolite) and the presence of other concomitant dusts, by and large it may be said that disease caused by asbestos is rarely manifested in less than ten to twenty years from onset of exposure.##

03304 131

Selikoff, I. J. J. Churg and E. C. Hammond

THE OCCURRENCE OF ASBESTOSIS AMONG INSULATION WORKERS IN THE UNITED STATES. Ann. N.Y. Acad. Sci. 132, 139-55, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

An investigation involving 1522 asbestos insulation workers in the New York-New Jersey metropolitan area has been conducted. Among 392 individuals examined more than 20 years from onset of exposure, radiological evidence of asbestosis was found in 339. In half of these, the asbestosis was moderate or extensive. In individuals with less than 20 years of exposure, radiological evidence of asbestosis was less frequent and when present, much less likely to be extensive. Neoplastic complications of asbestos exposure were studied among 307 consecutive deaths in this group of men. Lung cancer was found to be at least seven times as common as expected and cancer of the gastrointestinal tract three times as common as expected. There were 10 instances of mesothelioma of the pleura or peritoneum. Of the 1258 men alive at the start of this survey, 1117 were examined. Eleven cancers of the lung or pleura were found during this survey of the living members, all among the 392 men with more than 20 years from onset of exposure. No cancers were found in those men, the onset of whose work experience was less than 20 years. It is concluded that asbestosis and its complications are significant hazards among insulation workers in the United States at this time. (Author summary)##

01811 132

I.J. Selikoff, J. Churg, E.C. Hammond

RELATION BETWEEN EXPOSURE TO ASBESTOS AND MESOTHELIOMA. New Engl. J. Med. 272, 560-5, Mar. 18, 1965.

A study of 307 consecutive deaths (1943-1964) among asbestos-insulation workers in New York and New Jersey disclosed 10 deaths caused by mesothelioma of the pleura (4 cases) or peritoneum (6 cases). This is an extraordinarily high incidence for a tumor generally so rare that it is not separately coded among causes of deaths. In contrast, in a prospective study of the general population, among 31,652 deaths (in patients thirty to eighty-nine years of age), only 3 were due to mesothelioma. In 2 additional studies, the association of mesothelioma with asbestos was further indicated by the finding of 4 mesotheliomas of the pleura and 3 mesotheliomas of the peritoneum among 26 consecutive autopsies of cases of asbestosis and, also, by the finding of asbestos bodies in lung sections in more than 25% of cases of mesothelioma. It appears that mesothelioma must be added to the neoplastic risks of asbestos inhalation, and joins lung cancer (53 of 307 deaths) and probably cancer of the stomach and colon (34 of 307 deaths) as a significant complication of such industrial exposure in the United States.##

11327 133

I.J. Selikoff, E. C Hammond

TABULAR DATA ANALYSIS OF THE EVIDENCE SUGGESTING GENERAL COMMUNITY ASBESTOS AIR POLLUTION. Preprint, City Univ., New York, 9p., 1968. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session II: Epidemiologic Relationships, Paper 9.)

Tabular data is given on the epidemiology of occupational health hazards of asbestos air pollution. Geographical area, period of exposure, population, type of exposure, age, sex and pathological findings are presented.##

03307 134

G. K. Sluis-Cremer

ASBESTOSIS IN SOUTH AFRICA - CERTAIN GEOGRAPHICAL AND ENVIRONMENTAL CONSIDERATIONS. Ann. N.Y. Acad. Sci. 132, 215-33, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Author examined two major asbestos mining areas in South Africa which are three hundred miles apart and between which there is very little exchange of population. The production of crocidolite and amocite in the two sites indicate a real difference insofar as mesothelioma is concerned. Author concludes that the difference is not explicable on any environmental differences between the two mining areas.##

03314 135

G. K. Sluis-Cremer C. Pl Theron

A PROPOSED RADIOLOGICAL CLASSIFICATION OF ASBESTOSIS (PART I OF RADIOLOGICAL AND PATHOLOGICAL CORRELATIONS IN ASBESTOSIS IN THE REPUBLIC OF SOUTH AFRICA AND THE UNITED KINGDOM). Ann. N. Y. Acad. Sci. 132, 373-8, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The I.L.O. classification which is entitled "The International Classification" of persistent radiological opacities in the lung fields provoked by the inhalation of mineral dusts, has been employed successfully in codifying the X-rays of individuals exposed to the majority of dusts encountered in mining and industry, although for some time there has been a feeling that the code had some weakness when used in asbestosis, and that a new system was needed to facilitate diagnosis, epidemiological surveys and certification. However, as a large proportion of asbestos exposed workers are often also exposed to other dusts which produce other changes, and in view of the established success of the I.L.O.

classification in pneumoconiosis generally, it was agreed that it would be wiser to build onto the present code, rather than start afresh with a completely new system. To be successful, a classification of this nature should meet the following requirements: (a) It should describe in code-form the principal radiological features; (b) Readings should be repeatable by single individuals as well as between different trained observers; (c) It should differentiate between changes due to dust and to other abnormalities in exposed groups; and (d) It should be easy to use. A modification of the original classification has accordingly been evolved for use in asbestosis.##

03334 136

K. W. Smith.

TRENDS IN THE HEALTH OF THE ASBESTOS WORKER. Ann. N.Y. Acad. Sci. 132, 685-90, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Author suggests a re-examination of the parameters universally associated with the health hazards of asbestos workers. The confirmation that certain correlation techniques could be in error is discussed. Author concludes by saying that isolated studies of small selected groups may be interesting but the true picture of the biological effects of the asbestos fiber will emerge only when there is a broad study, conducted by an impartial agency, on a nation-wide scale.##

03321 137

W. E. Smith, L. Miller, R. E. Elsasser, D. D. Hubert

TESTS FOR CARCINOGENICITY OF ASBESTOS. Ann. N.Y. Acad. Sci. 132, 456-88, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Gross and histological changes following single massive intrapleural injections of asbestos into hamsters have been described. Thick fibrotic adhesions ensued. Later, pleural mesotheliomas were found in occasional hamsters that received brittle carieties of asbestos but not in those that had received a soft variety. No tumors have as yet appeared in the respiratory tracts of hamsters giben repeated intratracheal injection of these varieties of asbestos. Pulmonary fibrosis occurred following intratracheal injections, ut this was not comparable in thickness to the fibrotic lesions induced by intrapleural injections. The experiments show that asbestos can induce mesotheliomas in hamsters. Authors raise a question as to wheter these tumors signify a primary carcinogenic action of asbestos fibers or are secondary and nonspecific epiphenomena of fibrosis.##

03305 138

W. J. Smither

SECULAR CHANGES IN ASBESTOSIS IN AN ASBESTOS FACTORY. Ann. N.Y. Acad. Sci. 132, 166-81, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

A single factory in the East End of London has been manufacturing asbestos products for 50 years. Cases of asbestosis from this factory have been the subject of several publications which span the past 30 years. The changes in the disease with the passage of time were evaluated by comparing the findings reported previously with the findings in a series of cases which are under observation at present.##

16761 139

Stanton, Mearl F., Robert Blackwell, and Eliza Miller

EXPERIMENTAL PULMONARY CARCINOGENESIS WITH ASBESTOS. Am. Ind. Hyg. Assoc. J., 30(3):236-244, May-June 1969. 21 refs.

Three methods have been used to test the carcinogenic response of the lung and pleura of the rat to asbestos. No carcinogenic response of pulmonary epithelium or pleura was noted to either healing infarcts or implanted wax pellets that contained asbestos. Sarcomas of the pleura and pericardium developed in 74 percent of rats in which the pleura was covered with an asbestos-impregnated fibrous glass coat. The fibrous glass alone caused only slight reaction, with complete healing. The last method may serve as an accurate and convenient means of quantitating the neoplastic response of the pleura to asbestos. (Author's Abstract)

16739 140

Stokinger, Herbert E.

THE SPECTRE OF TODAY'S ENVIRONMENTAL POLLUTION--USA BRAND: NEW PERSPECTIVES FROM AN OLD SCOUT. Am. Ind. Hyg. Assoc. J., 30(3): 195-217, May 1969. 128 refs.

A comprehensive toxicologic evaluation of the potential human health hazards from man-made and natural environmental pollutants (except radiation) from air, water and food has been made to highlight the areas of greatest concern for health agencies in the U.S.A. The judgments are predicated on pollutant levels existing now or in the foreseeable future, and on the hereditary milieu of the population of the continental United States. (Author's Summary)

18162 141

Suzuki, Y., and J. Churg

STRUCTURE AND DEVELOPMENT OF THE ASBESTOS BODY. Am. J. Pathol., 55(1):79-91, April 1969. 30 refs.

Formation of asbestos bodies in the hamster lung from instilled chrysotile asbestos was followed by means of light, phase, and electron microscopy. This process took place in the cytoplasm of certain pulmonary cells, especially the alveolar macrophages, and, to a lesser extent, alveolar epithelial cells and septal cells. The successive steps consisted of: (1) phagocytosis of small fragments (often under 1 micron long and 300 A in diameter) and incorporation in cytoplasmic phagosomes; (2) appearance of hemosiderin the cytoplasm of the cells; (3) intracellular transporation of iron micelles from hemosiderin granules into the phagosomes; and (4) progressive concentration of the iron micelles in the vicinity of the fiber and partial clearing of the protein ground substance along the periphery of the phagosome. The central fiber, the coat of hemosiderin, and the investing membrane of the phagosome are considered to be the essential elements of an asbestos body. The presence of uncoated asbestos fibers is noted even after the lapse of 2 years. It is suggested that such fibers, in fact, have undergone phagocytosis, but have been released due to the death of the cell before they became coated with iron. These uncoated fibers probably continue to interact with the cells and may be responsible for the progressive alteration of the lung tissue. (Author's summary)

06270 142

K. Szymczykiewicz

THE MESENTERIC TEST AS A METHOD OF EVALUATION OF HARMFUL EFFECTS OF INDUSTRIAL DUST. Test Krezkowy Jako Metoda Oceny Stopnia Szkodliwosci Pylu Prez[illegible]myslowego. Med. Pracy (lodz, Pol.) 15 (4), 221-9 (1964) Pol.

Using the mesenteric test (injection of dust emulsion in sodium chloride solution between great lamina mesentery of the small intestine of a rat), the following 8 dusts were examined: fine glass, china, amorphous SiO2, fibrous glass, crystalline asbestos, kaolin, amorphous asbestos, and crystalline SiO2. Each dust was administered in 3 doses of 0.5 2.5 and 5.0 mg; after 3 months the summary weight of nodules resulting from these dusts was calculated as well as the weight increase in relation to the summary initial dose of 8 mg. Nodules were subjected to histopathologic examination. The corelation between summary weight of 3 nodules for each dust and collagen content of the lungs, obtained 10 mo. after pulmonary administration of these dusts, was calculated. It is stated that there exists a correlation between the dust activity and the increase of nodule weight as well as a high correlation (r - 0.86) between nodule weight and collagen increase in the lungs of an animal, to which dusts were given by intrapulmonary methods. From these findings it is concluded that the mesenteric test makes possible the evaluation of the biological activity of dusts.##

09534 143

Tabershaw, I. R.

ASBESTOS AS AN ENVIRONMENTAL HAZARD. J. Occupational Med., 10(1):32-37, Jan. 1968. 15 refs.

Asbestos minerals may increase the risk of lung cancer in occupational groups and may lead to an unusual risk of mesothelioma of the pleura and peritoneum in occupational groups and those living near asbestos plants. Such malignancies usually result from exposure 30-50 years earlier. Increased incidence of malignancy has occurred in populations which did not work with asbestos but happened to live near plants using amosite or crocidolite. Several autopsy studies have found that 25-50% of lung smears are characterized by asbestos bodies. These bodies may result from recent exposure as well as exposure many years earlier. Since world production and use of asbestos has increased from 500,000 tons to 3,500,000 tons in the past 30 years, asbestos is suggested as a major threat to public health.##

01093 144

S. Tanaka and J. Lieben

COMMUNITY CHEST X-RAYS FOR PNEUMOCONIOSIS PREVENTION. Arch. Environ. Health 12, 10-4, Jan. 1966.

Among 395,961 70 mm chest photofluorograms taken over the three-year period of 1961-1963 in 23 Pennsylvania Counties, there were 428 cases in which films were read as pneumoconiosis, silicotuberculosis, and generalized fibrosis. Of these, 111 of the persons were between ages 25 and 54. These were investigated further. Of the 111 persons studied, 43% were coal workers, 14% worked in brick and stone industries, and 9% in foundries. About 28% gave no history of occupational dust exposure. Thirty of the 48 coal workers came from one coal region county. The overall rate of medical follow-up was 88%. In the dust exposed group, about 50% of those followed were found to have non-occupational diseases of the lungs. All nine women in the study had no dust exposure. Neigher had the 14 cases that had been read as "generalized fibrosis." On the basis of 31 confirmed pneumoconiosis case reports, investigation for the source of dust exposure was conducted in 20 various-sized establishments; 14 are in current operation and are scheduled to be surveyed or to have recommendations for proper corrective measures.##

16547 145

Teyssier, L. and R. Lesobre

THE PLEURAL PLAQUES OF NONPROFESSIONAL ASBESTOSIS. (Les plaques pleurales de l'asbestose non professionnelle). Text in French. J. Franc. Med. Chir. Thorac. (Paris), 22(7):797-808, 1968. 15 refs.

Clinical descriptions of two cases of non-occupational asbestosis are presented which are attributed to pollution of the atmosphere in the neighborhood of asbestos processing plants. The presence of so-called pleural plaques, which are readily identified on the ordinary X-ray pictures when they are calcified, should suggest asbestosis whenever none of the conventionally accepted causes of this disease can be discovered. An investigation designed to establish whether or not a patient suffering from these plaques was in fact exposed to asbestos dust in the past should include not only his occupational history, but also his non-occupational environment. In some cases, occupational and non-occupational exposures to asbestos dust have taken place in succession. In addition to the two cases described in detail, the tracing of the history of a patient who was never occupationally exposed to the danger of pneumoconiosis, but who had lived in his childhood in close proximity of an asbestos processing plant is given. As no instances of non-occupational asbestosis have been described in France, it was thought useful to point out that it should be taken into consideration in diagnosing certain pleural calcifications.

03306 146

J. G. Thomson

ASBESTOS AND THE URBAN DWELLER. Ann. N.Y. Acad. Sci. 132, 196-214, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The extent of inhalation of asbestos fibers by urban dwellers was investigated by counting asbestos bodies in smears from the lung bases from 500 consecutive autopsies in subjects over the age of 15 in Cape Town, South Africa, and 500 in Miami, Florida. The results were similar in the two cities, and no less than 30 per cent of the males and 20 per cent of the females showed asbestos bodies. In 85 percent of the positive cases the bodies were scanty, were not associated with pulmonary changes, and were regarded as the result of contamination of the urban atmosphere. In six per cent of all the males examined the bodies were numerous and were presumably of occupational origin. As a limited basal asbestosis may be associated with malignant mesothelioma of pleura and peritoneum an increase in this tumor is forecast as the main ground for regarding asbestos as a potential urban hazard. While that view is conjectural, the finding of abundant asbestos bodies in the lung bases of 1 in 17 of the male hospital population suggests that the occupational hazard from asbestos is greater and more diversified than is at present realized. The main object of this work is to draw attention to the effects of a relatively new development, the widespread use of asbestos in cities, and to stimulate the obtaining of comparable figures from other parts of the world, to establish the baselines of urban asbestos inhalation of today, and enable us to detect increases in the future. (Author summary)##

09251 147

J. G. Thomson, W. M. Graves

ASBESTOS AS AN URBAN AIR CONTAMINANT. Arch. Pathol., 81(5):458-464, May 1966. 5 refs.

That asbestos fibers are now a hazard of urban living is confirmed in this study of 500 autopsies in Miami. Lung smears were evaluated for the presence of golden-yellow asbestos bodies on subjects aged 15 years and over, and the results compared with a comparable study performed previously in Cape Town. The overall positive findings in this study are remarkedly similar to those in the previous study: 31.6 percent of the males and 20.4 percent of the females were positive, with the peak incidence of 36.4 percent in the 45-54 age group. None of the subjects under 34 were positive and in most, including all the positive females, the asbestos bodies were scanty, and not associated with any pulmonary changes. Asbestos bodies are thought to result from breathing air contaminated with asbestos. Sources for air-brone asbestos exposure are discussed, and the conclusion is presented that both urban air contamination and industrial exposure to asbestos are likely to increase in the future, in view of the increasing consumption and diversity of uses fo asbestos and asbestos-containg products and of its virtual indestructibility.##

03318 148

M.L. Thomson, A.M. Pelzer, W. J. Smither

THE DISCRIMINANT VALUE OF PULMONARY FUNCTION TESTS IN ASBESTOSIS. Ann. N.Y. Acad. Sci. 132, 421-36, Dec 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

A clinical and pulmonary function field survey was made of 28 factory workers who had been exposed to asbestos dust for an average of 14 years. In certifying 19 of these as having asbestosis, the British Pneumoconiosis Board relied mainly on radiological abnormality and the presence of dyspnea and rales, in that order. Finger clubbing came next in importance and cyanosis, productive cough and wheeze were of relatively minor value. The power of 11 pulmonary function indices to discriminate between the certified workers, estimated by the U/Umax test, was greatest for inspiratory capacity, vital capacity, diffusing capacity for carbon monoxide and compliance. These indices therefore supported the Board's selection. The discriminant value was lower in forced expiratory volume and pulumonary capillary blood volume and poor in membrane diffusing capacity, air way conductance, peak flow rate, and residual volume/total lung capacity.##

03237 149

V. Timbrell

THE INHALATION OF FIBROUS DUSTS. (SECTION V. HUMAN EXPOSURE TO ASBESTOS : DUST CONTROLS AND STANDARDS.) Ann. N. Y. Acad. Sci., Vol. 132, p. 255-273, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The largest compact particles normally found in lungs are about 10 microns in diameter. The presence of asbestos fibers 50 microns and even 200 microns long can be explained by the fact that the parameter of the two main deposition mechanisms is particle free-falling speed, and for a fiber, this is predominantly determined by the diameter and not the length. If the diameter of an asbestos fiber is less than about 3.5 microns, the fiber stands a chance of escaping deposition by these two mechanisms and of penetrating deeply into the lung. The more symmetrical a fiber is, the greater its chance of penetrating. The limitation on the length of the fibers which reach the pulmonary air spaces is imposed by the nasal hairs and by the small diameters of the respiratory bronchioles. Pathologists can expect to find that places where respiratory bronchioles branch are preferred deposition sites for long fibers. (Author summary)##

03326 150

E. C. Vigliani, G. Mottura, and P. Marazana.

ASSOCIATION OF PULMONARY TUMORS WITH ASBESTOSIS IN PIEDMONT AND LOMBARDY. Ann. Acad. Sci. 132, 558-74, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

In Piedmont and Lombardy, there are at present about 4,000 asbestos workers employed in mining, and in textile and asbestos products factories. From 1943 to 1946, 879 cases of asbestosis were certified in the above regions; 830 cases in Piedmont and 49 in Lombardy. Of these, 172 died and 707 are still alive. The ultimate cause of death of the 172 subjects who died was in 15 cases carcinoma of the lung and in three cases mesothelioma of the pleura. One lung carcinoma and two pleural mesotheliomas were found among the 707 libing subjects. The incidence of death from thoracic malignancy among subjects with asbestosis has been compared with that found among workers with silicosis. Among 172 fatal cases of asbestosis, 15 carcinomas of the lung and three mesotheliomas of the pleura were found, that is 10.5 per cent of all cases. No cases of mesothelioma and 25 cases of carcinoma of the lung, that is 1.8 per cent, were found among 1,459 fatal cases of silicosis. Carcinoma of the lung therefore accounts for death in subjects with asbestosis five times more frequently than in subjects with silicosis. The rate of death from carcinoma of the lung and from mesothelioma has been studied in 24,700 nicropsies performed on people over 40 years of age in Turin, Milan and Pavia. In Turin and Milan, carcinoma of the lung accounts roughly for 4 per cent of the necropsies (5.3 per cent of men and 1.8 per cent of women); this is half the rate found among all subjects with asbestosis and one-fourth the rate among those who came to post-mortem. Mesotheliomas, either pleural or peritoneal, were found in 76 out of a total of 24,700 necropsies (0.3 per cent) of subjects over 40 years of age. Three cases of mesothelioma (all pleural) were found among the 172 fatal cases of asbestosis. Altogether, six cases of mesothelioma of the pleura occurred in people occupationally exposed to asbestos dust; three of them had worked with crocidolite and amosite besides chrysotile. In 10 cases of mesothelioma, not occupationally exposed to asbestos dust, where a lung specimen was available for study, no asbestos bodies were found.##

03327 151

J. C. Wagner.

EPIDEMIOLOGY OF DIFFUSE MESOTHELIAL TUMORS: EVIDENCE OF AN ASSOCIATION FROM STUDIES IN SOUTH AFRICA AND THE UNITED KINGDOM. Ann. N.Y. Acad. Sci. 132, 575-8, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Author presents case histories which support the theory of environmental exposure (as well as occupational exposure) to asbestos. Examination of individuals living in the vicinity of asbestos mining areas were found to have mesothelioma tumors upon biopsy examinations. The original investigations were conducted in South Africa, later to be conducted among similar situations in Great Britain. Although not confirmatory, it seems that there is a correlation between environmental exposure to asbestos and the occurrence of mesothelioma tumors.##

01476 152

J. C. Wagner

THE SEQUELAE OF EXPOSURE TO ASBESTOS DUST. Ann. N.Y. Acad. Sci. Vol. 132: 691-695, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The sequelae of exposure to asbestos dust, include its inhalation, deposition and the results of subsequent retention. In this article, all these subjects are discussed and a number of the controversial aspects clarified. Certain points of disagreement remain and there are many important facets yet unsolved. However, a number of these have been discussed and problems most urgently requiring investigation defined. This paper summarizes some of the salient features. (Author abstract)##

01477 153

J. C. Wagner, and J. W. Skidmore

ASBESTOS DUST DEPOSITION AND RETENTION IN RATS. Ann. N.Y. Acad. Sci., Vol. 132:77-86, Dec. 31, 1965. (Presented at the

Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

A method of producing asbestos dust clouds has been devised and an animal inhalation experiment carried out to test it. Observations on the histological distribution of the dusts in the lungs of the rats have shown that the dusts tend to accumulate in the alveoli arising directly from the respiratory bronchioles. The weights of the asbestos dusts found in the lungs of the rats at the end of exposure were found to differ considerably, but the subsequently determined elimination rates indicated that the weights of dust deposited were in a constant ratio with the weights of dust collected by the size-selective sampler. To deposit an equal amount of a nonfibrous dust, allowance must be made for the reduced efficiency of the upper respiratory tract in preventing the penetration of the compact dust particles to the alveolar regions. The elimination rate of Rhodesian chrysotile has been found to be three times greater than that of the amosite and crocidolite, which suggests an explanation for the previously observed reduced fibrogenicity of this dust. The reason for the difference in the elimination rate remains to be determined. (Author summary)##

03331 154

I. Webster.

MESOTHELIOMATOUS TUMORS IN SOUTH AFRICA: PATHOLOGY AND EXPERIMENTAL PATHOLOGY. Ann. N.Y. Acad. Sci. 132, 623-46, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Although the association of peripheral tumors of the respiratory tract appears to be related to the inhalation of asbestos, particularly crocidolite, there are sufficient points against this to suggest that the situation is reviewed continually and that other possible factors cannot yet be excluded. Although the exact classification of these peripherl tumors is difficult, this does not detract from the high incidence of such tumors in certain areas of South Africa where asbestos is mined, milled or processed.##

09964 155

Zolov, C., T. Bourilkov, and L. Babadjov

PLEURAL ASBESTOSIS IN AGRICULTURAL WORKERS. Environ. Res., 1(3):287-292, Nov. 1967. 10 refs.

Of 3,325 persons examined fluoroscopically in the Avren region of Southern Bulgaria, 155 (4.9%) exhibited pleural asbestosis. All persons lived within 10 km. of an asbestos mine, but only 23 (all males) of the 155 cases worked with asbestos and the remainder (86 males, 46 females) had no occupational contact with asbestos. The majorit (71.6%) were agricultural workers over 50 years of age. No occupationally exposed cases were found in persons over 60; this age spectrum is explained by the fact that asbestos production was begun in 1942. Agricultural work consisted mainly of tobacco growing on rocky soil and on many of the farms the stones in the tobacco fields showed obvious fibrous structure due to asbestos content. Thus, those persons not exposed to asbestos at the mine are considered to have been exposed to asbestos during farming.

BASIC SCIENCE AND TECHNOLOGY

03320 156

M. S. Badollet W. A. Gantt

PREPARATION OF ASBESTOS FIBERS FOR EXPERIMENTAL USE. Ann. N.Y. Acad. Sci. 132, 451-5, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

A method has been described for convenient preparation of asbestos fibers in lengths suitable for biological experimentation. This was accomplished by grinding asbestos in water in a Waring Blendor.##

03300 157

R. Gaze

THE PHYSICAL AND MOLECULAR STRUCTURE OF ASBESTOS. Ann. N.Y. Acad. Sci. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.) 132, 23-30, Dec. 31, 1965

Author confines the review to discussing varieties of asbestos that are used in industry and commerce. In general these types of fibers have appreciable tensile strength, strong enough to be handled on machinery that have been used for processing animal and vegetable fibers into textiles, paper and related items. Article is predominately concerned with chrysolite, amosite and crocidolite - anthophyllite, tremolite and actinolite are mentioned only briefly.##

03299 158

N. W. Hendry.

THE GEOLOGY, OCCURRENCES, AND MAJOR USES OF ASBESTOS. Ann. N. Y. Acad. Sc. 132, 12-22, Dec. 31, 1965 (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-20, 1964.)

Author discusses the relative predominance of asbestos (chrysotile) in North America, Africa, South America and Oceania (Autralia and New Zealand). The physical properties of asbestos, the world production by countries, and the major uses of asbestos are delinated.##

15082 159

REINFORCEMENTS: NEW GLASSES, FIBERS DEVELOPED. Mater. Eng., 67(2):40-41, Feb. 1968.

New fibers and reinforcements for use in structural applications are discussed. Boron nitride fibers possess high electrical resistivity, good thermal conductivity, high resistance to self-abrasion and wear, and have high tensile strengths. These fibers, however, are expensive, some are sensitive to water, and others are available only as powders or in limited shapes. Potential applications include ablation shields, space suits, re-entry parachutes, industrial dust collector bags, and high-temperature electrical insulation. A new commercial S-glass is being tested which has a low density, high modulus and strength, and is close to conventional E-glass in price. Whiskers have high tensile strengths and moduli but are exceedingly expensive. High modulus graphite fibers possess a low density, high strength and stiffness, and great resistance to chemical and radiation damage. Potential use is in reinforced epoxy resins and the aircraft industry. Asbestos reinforced plastics have the same increased mechanical properties as the glass fiber and offer low cost. An asbestos-filled nylon is said to be the first non-glass fiber reinforced material that achieves the degree of reinforcement of short glass fiber materials. It allows better bonding, no dilution, and low cost. Potential applications include under-the-hood uses in automobiles, boats, bake ovens, and in the electrical and electronic industries. TFE-fluorocarbons filled with molding grade acetals have the advantages of increased toughness, dimensional stability, increased friction resistance. Their disadvantage is that acetal's stiffness and strength are reduced when blended with virgin acetal to get lower cost material. One use of the material is in the electric knife.

13842 160

Uyehara, O. A. and K. M. Watson

OXIDATION OF SULFUR DIOXIDE. Ind. Eng. Chem., 35(88):541-545, May 1943. 7 refs.

The data of Lewis and Ries on the oxidation of sulfur dioxide in a flow system over a platinized asbestos catalyst were used to evaluate two complete rate equations: one which assumes that the rate-controlling step is a surface reaction between activation-absorbed sulfur dioxide and atomic oxygen, and an alternate form which implies no adsorption of sulfur dioxide. The first equation was found to give slightly better correlation with the experimental data and to represent it as accurately as the empirical equation developed by Lewis and Ries. However, it could not be determined whether the adsorption equilibrium constants and the overall temperature coefficient terms evaluated are roughly applicable to other platinum catalysts for this reaction.

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